Santa Clara Valley Water District

PRIVATE WELL WATER TESTING PROGRAM

NITRATE DATA REPORT

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Project Manager:	Frances W. Brewster, Water Quality Specialist
Laboratory Services:	James N. Scott, Lab Unit Manager
Fact Sheet and Flyer Production:	Christy F. Adams, Public Information Representative
Project Review:	Thomas I. Iwamura, Senior Engineering Geologist Tracy Hemmeter, Senior Water Quality Specialist Sandy K. Oblonsky, Associate Engineer

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EXECUTIVE SUMMARY

Recognizing that nitrate contamination exists in parts of the Llagas Groundwater Basin, the Santa Clara Valley Water District (District) conducted voluntary nitrate tests on private water supply wells located in the Llagas and Coyote Groundwater Basins of Santa Clara County. This report summarizes the program and the findings and makes recommendations for further action and investigation.

The purpose of the testing program is twofold. First, the testing of private, drinking water supply wells serves as a mechanism to educate the well water users of the issues surrounding nitrate contamination in the groundwater basins. Through educational programs, the District hopes to inform well water users on ways to limit their exposure to nitrate as well as to reduce further nitrate loading to groundwater supplies. Second, the data obtained by the testing program is used to assess the areal extent of the nitrate contamination within the basins. Analysis of the data is somewhat limited by a lack of construction information on a majority of the wells sampled. In addition, the location and depth of the wells sampled was dictated by the voluntary response of the participants, rather than selected to represent an even distribution.

Between January and August of 1998, 598 wells were sampled and analyzed for nitrate. Within 2 weeks of sampling, residents were notified of the level of nitrate in their well water. A fact sheet describing nitrate, its health effects, sources, treatment, and prevention, as well as sources of more information, was included with the results.

While over half the wells tested exceed the maximum contaminant level established by the federal safe drinking water standards, about 25 percent of the residents using private supply wells are actually exposed to concentrations of nitrate above the safe drinking water standard because a large number of residents already treat their well water or drink bottled water. An unknown percentage altered their drinking water habits after receiving the results of the test.

As was found in past studies, the data collected during this testing show that nitrate contamination is wide spread and is not restricted to any particular area within the Llagas and Coyote Groundwater Basins. Concentrations still seem to be increasing over time. Within the group of wells with known depths, nitrate concentrations above the safe drinking water standard were found in all depths tested. However, a majority of the wells tested are of intermediate depth or are perforated in both the shallow and intermediate zone. Deep, public supply wells were not tested during this program. Due to a lack of aquifer specific well construction and hydrogeological information, no aquifer specific or depth of contamination conclusions could be made from the data collected during this program.

Four areas of further action are recommended: reduce nitrate exposure, reduce nitrate loading, monitor nitrate occurrence, and remediate nitrate contamination.

- To reduce nitrate exposure and to reduce nitrate loading, it is recommended that the District continue to employ educational, voluntary activities. The District should produce and distribute educational materials on well water testing and treatment as well as on Best Management Practices (BMP) for agriculture, garden and yard maintenance, manure management, and septic system maintenance.

- To monitor nitrate occurrence, seasonal, areal, and vertical variations of nitrate concentrations should be monitored. Shallow monitoring well and/or vadose zone sampling should be conducted

to assess what, if any, affect our nitrate management program is having on the levels of nitrate entering the water supply.

- To remediate nitrate contamination, several options are discussed, including additional recharge, pump and treat technologies, phytoremediation, and reactive zone remediation.

INTRODUCTION

Communities in the southern portion of Santa Clara County rely solely on groundwater from the Llagas and Coyote Groundwater Basins for their drinking water supply. The District is responsible for managing the groundwater basin to ensure its viability as a long-term potable water supply. Previous water quality studies have shown a trend of increasing nitrate concentration in a number of water supply wells. Groundwater from some municipal and private water supply wells have been found to contain concentrations of nitrate greater than those allowed by federal safe drinking water standards.

The present maximum contaminant level (MCL) for nitrate in drinking water is 45 milligrams per liter as nitrate (mg/L-NO_3), as promulgated by the United States Environmental Protection Agency (USEPA). Nitrate levels above 45 mg/L are occurring in an increasing number of wells in the Llagas and Coyote Groundwater Basins. Refer to Maps A-1 and A-2 in Appendix A for the study location. Therefore, in October of 1991, the District initiated the Nitrate Management Program to manage nitrate contamination in the Llagas Groundwater Basin.

Elevated nitrate concentrations are a concern because of the susceptibility of infants less than 6 months of age to methemoglobinemia (blue baby syndrome) from exposure to high levels of nitrate in water. In addition, research is being done to determine whether excess nitrate in food and drinking water might also have long term carcinogenic (tendency to cause cancer) or teratogenic (tendency to cause fetal malformations) effects on exposed populations (Ward, M.H., et al., 1996, Bruning-Fann, C.S., et al., 1993).

Three areas of action were identified by the District during a 5-year study: action to reduce nitrate exposure in the community, action to reduce nitrate loading, and action to monitor nitrate occurrence. The Private Well Water Nitrate Testing Program was designed to reduce nitrate exposure through educational outreach and to monitor nitrate occurrence. In addition, by educating the well water users on the concentration of nitrate in their drinking water as well as on the issues surrounding nitrate contamination, the program hopes to spur action to reduce nitrate loading.

PROGRAM DESCRIPTION

The District recommends that residents on private water supply wells test their drinking water for nitrate and bacteria at least once per year, more frequently if a noticeable change in taste, color, odor, or major land use occur. State and federal laws require that public water suppliers and owners of wells that serve five or more homes monitor the water quality regularly. Private well owners and users are responsible for implementing their own testing program. The District is aware that many private well owners and users do not test their drinking water quality regularly and, therefore, may inadvertently expose themselves to potential health risks.

To inform private water well users of the potential health risk associated with drinking water with elevated nitrate concentrations and to increase their awareness of the issues associated with nitrate

contamination, the District offered a well water nitrate test to all well water users in the South County area. The District sent a mailer to all registered well users in the Llagas and Coyote Groundwater Basins to inform them of this service. The mailer has a stamped, detachable card to mail back if the well user is interested in the service. Media coverage was used to reach those residents that did not receive the mailer. A hotline phone number remains available for residents to schedule testing and to address concerns and questions.

District personnel collected water samples from as many wells within the Llagas and Coyote Groundwater Basins as possible. The District's laboratory personnel analyzed the samples. Test results were sent to the well user along with recommendations for action and a fact sheet on nitrate in drinking water wells.

SAMPLING OBJECTIVES

The primary goal of the program is to serve as a mechanism to educate the public on nitrate contamination in the groundwater. First, it will inform well water users of the concentration of nitrate in their drinking water. Second, it will notify well water users of the health risks associated with nitrate contamination. Third, it will provide assistance in the treatment or location of alternate drinking water sources. Fourth, it will emphasize the importance of regular testing of drinking water to ensure a safe supply. Finally, it will outline sources of nitrate contamination and describe practices to safeguard the groundwater for the future.

Secondarily, the data will supplement the existing database on nitrate concentrations in the Llagas and Coyote Groundwater Basins. This additional data will help the District monitor the distribution of nitrate within the basins in more detail than previous, limited well sampling data has allowed.

METHODS

Notification

Fliers were mailed out in groups of 100 to 300 fliers every week to the site addresses of registered wells in the Llagas and Coyote Groundwater Basins beginning in January 1998. The fliers were mailed in order of well number, starting at the north end of Llagas Basin and working south to the county line, then returning to the north end of Coyote Basin and working south to the Llagas Basin boundary. Site addresses were used in order to reach the well water consumers rather than owners not living on the property. The District was able to obtain complete site address information and mail fliers for 2,500 of the 3,128 registered wells. Of those mailed, 209 were returned as undeliverable; sent to vacant properties, agricultural fields, or residents with post office boxes.

The fliers have a detachable card for residents to complete and return, postage paid, to the District to schedule a nitrate test. Information in the flier, in both English and Spanish, includes sources of nitrate contamination, the health risks associated with consuming elevated levels of nitrate, and the importance of regularly testing the drinking water quality. The fliers also stress that the nitrate results are for private use only, that the District cannot require or provide service to correct the drinking water quality of privately owned wells. Also, the nitrate test does not preclude the presence of other contaminants. Residents were told that District personnel would contact them

to schedule a sampling time and location and that they do not need to be home during the sampling.

A press release was issued to local English and Spanish media in January announcing the District's well tests. The release indicated that postcards were being mailed to 2,100 residents in the South County area. Approximately 80 phone calls were received within the first 2 weeks after the press release from residents requesting the well test or more information on nitrate in drinking water. Another press release was issued in mid-May after all the fliers had been mailed to try to reach anyone who had not received a flier due to incomplete site address information. The second press release was issued at the same time a story on the nitrate contamination of the public well in Chualar, California, in Monterey County reached the national press. Television Channels 5, 11, and Cable channel BayTV, as well as a Bay Area radio station, ran stories on nitrate contamination locally. Approximately 50 calls were received within the 2 weeks immediately following the second press release and ensuing media coverage.

Sample Scheduling

Sampling events were scheduled for Mondays and Tuesdays between January and August of 1998. Once the detachable card was received, sampling routes and times were determined. Residents were called to inform them of the date and time of sampling and to discuss directions to the house and to the well. When no one answered the phone, a message was left on the answering machine informing them of the sampling date and time and asking that they call back to confirm the appointment and give directions to the house and to the well. When there was no return call, the well was sampled on the date and time mentioned only if the well location was obvious and in the front of the home or if someone was home. Otherwise, a card was left asking that they call to reschedule and give directions to the well.

Nitrate Exposure Survey

In order to ascertain what percentage of the population is actually being exposed to high levels of nitrate in their drinking water, an attempt was made to survey all participants on their current water consumption practices. Residents were asked if they drank the well water or bottled water. They were also asked if they had any treatment system and, if so, what type.

Sampling Observations

Upon arrival at the site, a description was written of the surrounding area with particular attention paid to nitrate sources and their distance from the well. Any unusual observations were noted. During the later part of the sampling period, weather conditions were noted along with the sample color and odor. When the resident was present during sampling, the procedure was described and every attempt was made to talk about further testing, well construction and protection, and answer any questions he or she had.

Sampling Location

The priority of the sampling program was to collect water most representative of the drinking water of the household, while still representing groundwater conditions. Water samples were collected from the faucet closest in line to the well wherever possible. The actual location sampled was recorded on the data sheets.

Sampling Procedure

The pipe and well were allowed to flush for several minutes before a sample was drawn. During the flushing period, pH, electro-conductivity, and temperature were recorded on several samples spaced a minute or two apart. Measurements were recorded on the data sheet. After the measurements stabilized and at least 5 minutes had passed, a sample was taken. Samples were stored on ice or at 4°C until analysis.

Sample Analysis

The District's Rinconada laboratory analyzed the samples for nitrate following USEPA Method 300.0. Monday and Tuesday's samples were analyzed Tuesday evening, within the 48-hour holding time for nitrate. The quality control program consisted of matrix spikes and duplicates run on every tenth sample. Laboratory control samples and known standards were also analyzed with each batch of samples. The Quality Control Reports are provided in Appendix C.

Analytical Results

Within 2 weeks of sampling the well water, the residents were mailed the results of the analysis. Several master result letters were created depending on the level of nitrate detected. A fact sheet entitled "Nitrate in Drinking Water Wells: Protecting Your Water Supply" accompanied all result letters. The fact sheet includes information on the following topics: what nitrate is, where it comes from, how it reaches groundwater supplies, the health effects of consuming high levels of nitrate, how nitrate is detected, what the test results mean, alternate water supplies and treatment options, the importance of regular testing, guarding against nitrate contamination, and a list of sources for further information.

It was important to the success of the program that residents did not feel threatened that the District would require costly repairs on their wells if they participated in the testing program. Whenever possible, where the above ground well construction was in disrepair (i.e., cracked or missing concrete pedestals), either the resident was informed during the sampling or a paragraph was added to the result letter detailing the importance of wellhead maintenance. In addition, approximately 15 sample port plugs were supplied to residents whose well caps had missing or broken plugs. The residents were instructed on how to install the plugs. No installations or repairs were made by District personnel.

RESULTS AND DISCUSSION

Notification

Based on marketing studies (personal communication with Ms. Christy Adams), there is typically a 20 percent response rate to a free mail offer. Based on this expectation, the goal of this program was to test at least 20 percent of the domestic wells within the Llagas Groundwater Basin. The District exceeded this goal. Of the fliers actually delivered, 26.1 percent (598 out of 2,291) were returned for the nitrate test. Requests continue to be received, and the District will continue to test wells for nitrate as long as the demand continues. Within both groundwater basins, 20.8 percent of all the wells that are reportedly used for drinking water were tested. Among the

wells used solely for domestic water supply, over 23 percent were tested. The following table shows the number of wells tested to date in each reported use category.

Water Use Category	Total # of Active Wells[1]	# of Active Wells Tested[1]	% of Active Wells Tested[1]
Domestic Only	2092	486	23.2
Domestic & Municipal	19	4	21.1
Domestic & Agricultural	413	48	11.6
Municipal Only	96	11	11.5
Municipal & Agricultural	28	3	10.7
Total with Drinking Water Use	**2648**	**552**	**20.8**
Agricultural Only	474	13	2.7
Unclassified or Unknown	13	0	0.0
Total	**3135**	**565**	**18.0**

[1]Registered wells within the Llagas and Coyote Groundwater Basins only.

Nitrate Exposure Survey

Approximately half the residents whose wells were tested were asked if they drank the well water or bottled water. If they drank well water, they were asked if they had any treatment systems in line. Approximately 44 percent of the residents surveyed use an alternate water supply or remove the nitrate through treatment systems for at least some of their drinking and cooking water. Among those surveyed whose nitrate is above the MCL, 47 percent either use bottled water or remove the nitrate through treatment systems for at least part of their drinking and cooking water. Extrapolating these findings to all private well water consumers in the South County area, about 25 percent are exposed to high levels of nitrate in their drinking water. Following is a breakdown of the resident's drinking water habits. The number that reported drinking only untreated well water may be higher than actual due to poor communication of the question. Some residents would respond that they drank untreated well water, but later in the conversation would mention that they drank bottled water or had a treatment system for their drinking water.

Drinking Water Description	# of Responses	% of Total Responses
Bottled Water or Alternate Water Source	95	32
Reverse Osmosis, Distillation, or Anion Exchange	37	12
Untreated Well Water	122	40
Other Treatment System	48	16
Total (out of 598 wells sampled)	302	100

In a few instances, the treatment systems were tested to quantify how well they were removing nitrate from the well water. There were no homes with anion exchange systems to test. Only one distillation unit was tested. It removed 99.7 percent of the nitrate (62.4 mg/L NO_3). Several different reverse osmosis units were tested with results varying from 95.2 percent nitrate removal to 2.8 percent removal. The units ranged in price from $160 to $800 or more. The cost of the unit was no indication of how well it performed. The lowest priced unit performed as well or better than some of the higher priced units. It must be noted that the reverse osmosis units tested were installed with a range of pretreatment systems and a range of groundwater nitrate levels and water conditions. According to the residents, all except one system were maintained according to the manufacturer's specifications. None of the systems were tested in large enough numbers to draw any conclusions except that not all reverse osmosis units remove significant amounts of nitrate all the time.

Treatment System	# of Systems Tested	% of Nitrate Removed		Amount of Nitrate Removed (mg/L)	
		Range	Average	Range	Average
Reverse Osmosis	9	2.8 to 95.2	59.6	1.2 to 58.7	33.0
Distillation	1	99.7	99.7	58.7	62.4

Though there was no formal follow-up survey to determine the percentage of residents that changed their drinking water habits based on the results of the nitrate test, a few residents indicated that they intended to install a treatment system pending the outcome of the test. A few residents also called to say they had installed treatment systems or switched to bottled water as a result of the nitrate level in their well water.

Sampling Observations

During sampling, a description of the surrounding area was made, with particular attention made to nitrate sources and their proximity to the well. It was observed that nitrate sources exist in close proximity to a vast majority of the wells sampled. There are significant numbers of agricultural fertilizer sources, including orchards, row crops, and greenhouse operations within both groundwater basins. While the number of large scale dairies and egg farms is relatively small, there are a significant number of homes with horses, sheep, goats, llamas, pigs, chickens, or other animals. In some instances, the well was located within the animal enclosure, with feces on the ground around the wellhead. Whenever possible, residents were informed of the hazards of locating their well within 100 feet of an animal enclosure. A majority of the wells sampled supply single family homes on septic systems.

It was an unusually wet winter season. The rainfall for the season was significantly more than the normal level. The average annual rainfall for Santa Clara County is 13.73 inches (Public Information Office, Santa Clara Valley Water District). During the 1997 to 1998 rainy season, the four South County rain gauge stations averaged 31.85 inches (District website). In addition, the rainy season extended into June, rather than the usual November to March season. During January and February sampling, several wells had brownish colored water. Residents explained that the coloration was typical of winter conditions and generally cleared up in the spring and summer.

Sampling Location

Every attempt was made to sample the water from the faucet closest in line to the well. Of the 598 wells tested, 52 percent were collected in the immediate vicinity of the well, either from the wellhead itself (8 percent) or a small pressure tank at the wellhead (44 percent). The remaining wells were sampled from faucets at the house or from large holding tanks.

Sample Analysis

All samples were analyzed within the 48-hour holding time for nitrate samples. All the quality control analyses were performed and were within the acceptable limits for the analysis. The Quality Control Reports are included in Appendix C.

During the sampling program, one resident had his well water analyzed for nitrate by the District and by a private, state certified laboratory. The District reported a level of 50 mg/L NO_3, while the private lab reported 30 mg/L NO_3. A split sample was analyzed with the same results. After discussions with Mr. Jim Scott in the District's laboratory, it was decided that the cadmium reduction method used by the private lab is more susceptible to interferences in the groundwater matrices such as high levels of iron and other metals commonly found in groundwater. The private laboratory was not contacted to determine if they had added a chelating agent to eliminate the interference. Interferences in the ion chromatography method used by the District are easily identified and would have been detected during the quality control procedures. Caution should be used when interpreting results from different labs. If low recoveries are common with different test methods, then residents could be exposed to high nitrate concentrations despite careful monitoring programs.

Analytical Results

At the time of this report, 598 wells have been tested in the Llagas and Coyote Groundwater Basins and in the bedrock area of South Santa Clara County. Of the 598 wells tested, only 6 (1 percent) had nitrate levels below the detection limit of the analysis (<0.05 mg/L nitrate). Sixty-six (66) wells (11 percent) had nitrate concentrations lower than a natural background level of 10 mg/L nitrate. Over half (303) of the wells had nitrate concentrations above the MCL (45 mg/L). Twenty-three wells (3.8 percent) had nitrate concentrations more than twice the MCL (90 mg/L nitrate). Concentrations ranged from below the detection limit of the analysis to 204.7 mg/L. The District will continue to sample wells upon request when there is sufficient demand to merit a sampling and analysis event.

Areal Distribution

Within the Llagas Groundwater Basin, nitrate contamination appears to be wide spread. All areas show nitrate levels above natural background levels. Refer to the Maps A-3 through A-6 in Appendix A to see the areal distribution of nitrate levels. While the average and median nitrate concentrations were considerably higher in the Llagas Groundwater Basin than in the Coyote Groundwater Basin or in the bedrock area, nitrate contamination does not appear to be restricted to any particular area.

As was expected, the nitrate concentrations in the bedrock area are significantly lower than the levels within the basins. However, 60.6 percent (20 out of 33) of the wells tested in the bedrock area have nitrate levels above a natural background concentration of 10 mg/L

nitrate, indicating that human sources are also impacting these wells. It should be noted that most of the wells tested within this area are located at the base of hills, within small mountain valleys, or along the outer edge of the groundwater basins. The results are as follows:

Results per Geologic Area:

Well Location	# of Wells Tested	% of Wells above MCL (45 mg/L NO_3)	Average Concentration (mg/L)	Median Concentration (mg/L)	Maximum Concentration (mg/L)
Llagas Basin	508	55.3	47.7	47.0	204.7
Coyote Basin	57	31.6	31.7	31.9	86.5
Bedrock Area	33	12.1	21.9	16.4	99.0
Total	**598**	**50.7**	**44.8**	**45.1**	**204.7**

The Llagas Groundwater Basin is divided into three major hydrographic units: the forebay and the upper and lower aquifer zones. The forebay region, or unconfined zone, is made up of unconsolidated gravel, sand, silt, and clay deposited by streams originating in the Santa Cruz and Diablo Mountain Ranges to the west and east, respectively. The deposits range from a thin layer on the western edge to about 700 feet on the eastern edge. Groundwater recharge is primarily from stream flow and rainfall percolation. Nitrate contributions on the surface can percolate directly into the aquifer. Within the forebay region, groundwater flow is generally in a southeasterly direction. The Eastern Small Fans and Western Fans are included with the forebay regions in this discussion.

The upper and lower aquifer zones are located in the southern flat interior portion, also called the confined zone. The confined zone begins in the vicinity of Rucker Avenue and runs south past the Pajaro River. Fine-grained, low permeability, confining layers (aquitards) range in thickness from 40 to 100 feet. This area is divided into an upper, middle, and lower aquifer zone, each separated by an aquitard. Due to limited well construction information, only two of the wells tested in the confined zone are known to perforate only the upper aquifer zone. Both these wells are located in the northwest corner of the confined zone where the aquitards may be less defined. Nitrate levels in these wells were 68 and 50 mg/L. Recharge to the confined zone is primarily from subsurface flows from the forebay region.

Within the Llagas Groundwater Basin, both the Nitrate Data Review (August 1993) and the Sample Analysis (May 1995) Reports indicated that the highest concentrations of nitrate occur within the confining layer in the southern portion of the basin. The current data indicate that the average concentration within the confined zone is still higher than that within the unconfined zone. However, concentrations exceeding twice the MCL (90 mg/L)

were found in both areas. A map of the Santa Clara County Groundwater Basins and Llagas Groundwater Basin subunits is included in Appendix A (Maps A-1 and A-2). The Llagas Groundwater Basin subunit breakdown is presented below.

Location[1]	# of Wells Tested	NO_3 Concentration Range (mg/L)	Average Concentration (mg/L)
Unconfined Zone	365	ND[2] - 136	45.2
Confined Zone[3]	143	ND - 205	54.4
Total	508	ND - 205	47.7

[1]Llagas Groundwater Basin wells only.
[2]ND = Below the detection limit of the analysis.
[3]While the confined zone is divided into the upper and lower zones, there were very few wells tested that draw water from only the upper zone. These numbers reflect all wells tested in both zones.

Within the unconfined zone, groundwater is recharged through rainfall, stream flows, and artificial recharge activities. It appears that nitrate concentrations in the immediate vicinity of artificial recharge activities are lower than elsewhere in the unconfined zone. Of the wells within 1,000 and 2,000 feet of a recharge facility, 13 percent and 21 percent, respectively, exceed the MCL. Average nitrate concentrations within this area are also reduced. Refer to Maps A-7 and A-8 in Appendix A. Since the area sampled was based on the voluntary response of residents, the results may be somewhat distorted due to the uneven distribution of wells sampled. The tabulated results are presented below.

Location	# of Wells Tested	Avg. NO_3 Conc. (mg/L)	% > MCL
Within 1,000′ of Recharge	46	23.7	13
Within 2,000′ of Recharge	124	31.9	21
All Unconfined Zone	365	45.2	51

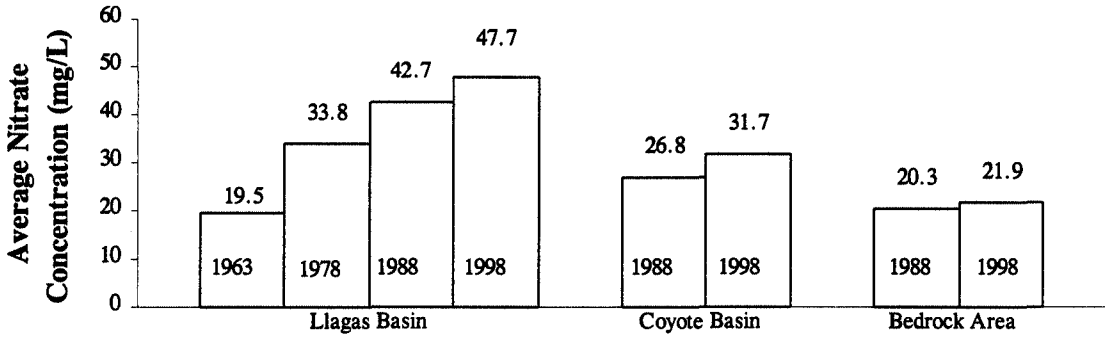
Temporal Distribution

There have been several studies of groundwater quality in the South County area. In 1963, the Department of Water Resources published a report, Mineral Quality Criteria South Santa Clara Valley. Approximately 115 wells in Llagas Basin were analyzed for nitrate between 1955 and 1960. The Department of Water Resources published a second report in 1980, South Santa Clara Valley Groundwater Quality Investigation. The second study tested approximately 142 wells in the Llagas Basin area in 1978. In 1988, the Santa Clara County Health Department completed a 2-year, countywide program of private well water sampling. A random sampling of 542 wells in the South County area were tested. Data from the Santa Clara County Health Department's testing program is listed in Appendix D.

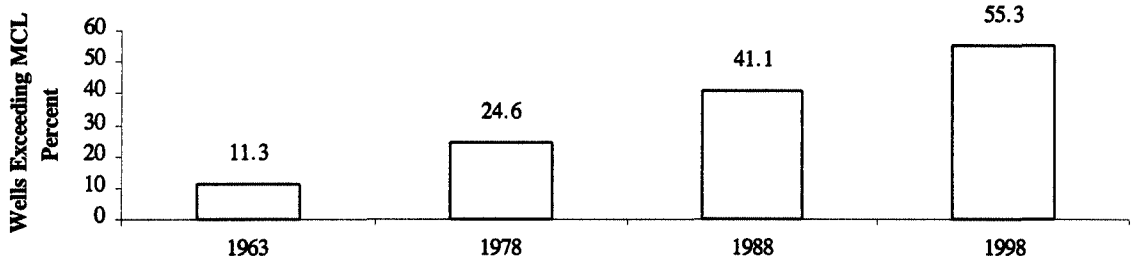
Specific well comparisons between the programs are difficult due to the restructuring of the well numbering system over the years and a lack of wells used in all four sampling

programs. Therefore, rather than compare differences in specific wells over time, this study compares general trends from all the wells sampled.

Confirming the findings of past studies, the average nitrate concentrations within the groundwater basins appear to be rising over time. Presented below is a comparison of the average nitrate concentrations found in each of the studies.



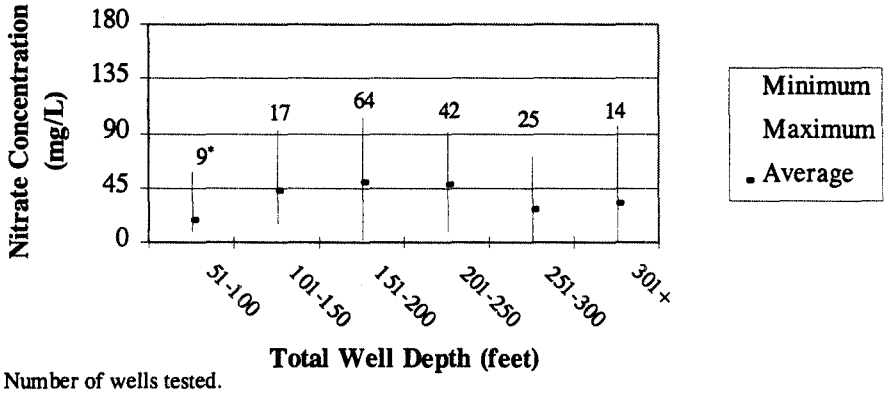
The average nitrate concentration is increasing not because a few wells are bringing the average up but because more wells have higher concentrations of nitrate now than in the past. As graphed below, the percent of wells tested that exceed the MCL has been increasing over time. The graph includes wells in the Llagas Basin area only.



Vertical Distribution

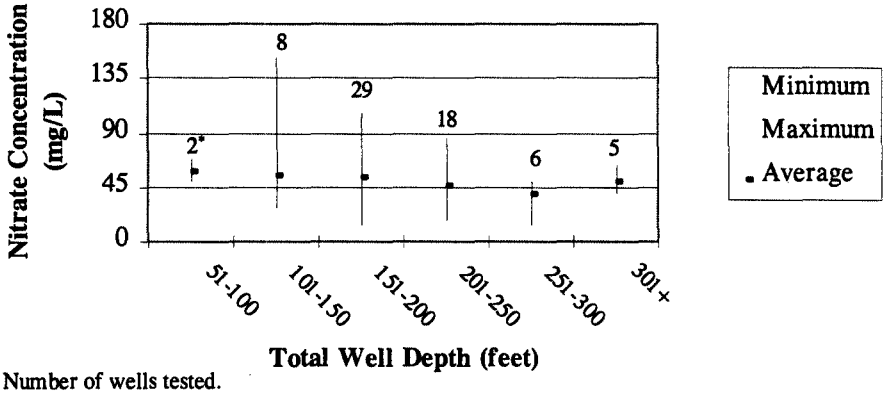
Due to the small number of wells tested in the Coyote Basin and bedrock area that have known well construction information, only those wells with well construction information in the Llagas Groundwater Basin were examined for depth to nitrate trend analysis. Within Llagas Basin, 239 wells with known total depths were tested, 171 in the unconfined zone, and 68 in the confined zone. As in the Sample Analysis Report, there are wells with nitrate levels above the MCL at all depths tested. However, not all depths in all areas were tested during this study. In addition, the deeper wells tested may be perforated in several shallower aquifers as well. Past studies have indicated that nitrate levels decrease as well depth increases. There was no correlation between individual well depth and nitrate concentration in this study. Below, the minimum, maximum, and average nitrate concentrations within the unconfined and confined zones is charted per total depth of the well.

Llagas Basin - Unconfined Zone



* Number of wells tested.

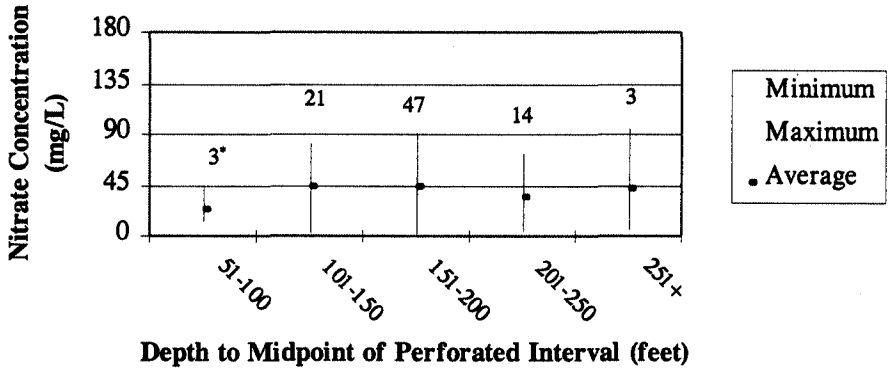
Llagas Basin - Confined Zone



* Number of wells tested.

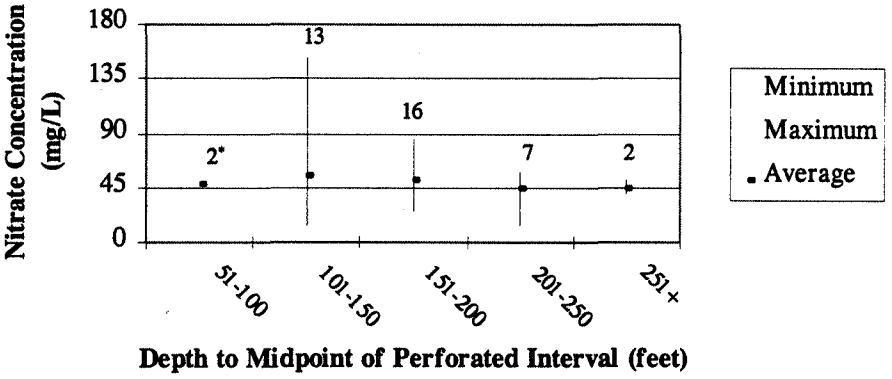
Most of the well screens sampled span long intervals, making depth-specific conclusions impossible. Shallow groundwater can be diluted with deeper groundwater in wells with long screen intervals. In order to determine if screen depth is related to nitrate concentration, we calculated the midpoint of the screen intervals. Within the Llagas Basin, we know the perforated intervals of 128 of the wells tested, 88 within the unconfined aquifer and 40 in the confined aquifer. As with total well depth, there does not appear to be a correlation between the depth to the midpoint of the screened interval and nitrate concentration. The data is presented below.

Llagas Basin - Unconfined Zone



* Number of wells tested.

Llagas Basin - Confined Zone



* Number of wells tested.

CONCLUSIONS

The Private Well Water Nitrate Testing Program was an overall success. The District exceeded its goal of testing at least 20 percent of the domestic wells in the Llagas and Coyote Groundwater Basins. Many of the wells had not been tested for 10 years or more. The program served as a mechanism to educate the well water users on nitrate contamination in the groundwater. Through the program, the District informed well water users of the concentration of nitrate in their drinking water. It notified well water users of the health risks associated with consuming high levels of nitrate. It provided assistance in the treatment or location of alternate drinking water sources. It emphasized the importance of regular testing of drinking water to ensure a safe supply. Finally, it outlined sources of nitrate contamination and described practices to safeguard the groundwater for the future.

While over half of the wells tested exceed the MCL for nitrate, we extrapolated that about 24 percent of the residents drinking private well water are exposed to potentially unsafe levels of nitrate due to the use of alternate sources of water and treatment systems for at least part of their drinking and cooking water. A follow-up survey may reveal that even fewer residents are exposed to high levels of nitrate due to the installation of new treatment systems or the use of alternate water supplies since receiving the results of the nitrate test.

Secondarily, the data supplemented the existing database on nitrate concentrations in the Llagas and Coyote Groundwater Basins. The data indicate that nitrate contamination is wide spread and not restricted to any particular area. Nitrate levels in the Llagas Groundwater Basin exceed those in the Coyote Groundwater Basin and in the Bedrock area, though no area is immune. It appears that wells in proximity to groundwater recharge areas have lower nitrate concentrations than elsewhere in the basins. This trend needs to be confirmed with further studies.

Nitrate concentrations appear to still be increasing over time. Both a greater percentage of the wells are affected and the median and average concentrations are increasing.

Depth-specific conclusions are difficult to ascertain due to a lack of detailed well construction information and a lack of detailed hydrogeological information. Since practically all the nitrate entering the groundwater percolates from the land surface, as nitrate contributions are reduced on the land surface, we would expect to see a reduction of nitrate concentrations first in the shallow groundwater. Further studies are needed to determine if the concentrations in shallow wells are, in fact, lower than in deeper wells. Any depth-specific study needs to address whether an observed trend indicates that the tail end of past nitrate contributions is finally moving through the upper water table or whether the trend is due merely to seasonal fluctuations.

RECOMMENDATIONS

The recommendations of the Llagas Groundwater Basin Nitrate Study Final Report were divided into three categories: recommendations to reduce nitrate exposure, recommendations to reduce nitrate loading to Llagas Basin, and recommendations to monitor nitrate occurrence in Llagas Basin. This report maintains the original three areas of recommendations and adds a fourth: recommendations to remediate nitrate contamination. Included in each category are recommendations for implementation in the next few years and future considerations to be evaluated for implementation in the next 3 to 5 years. A time line for implementation is included at the end of this section.

Recommendations to Reduce Nitrate Exposure

Before the public can take action to reduce their exposure to nitrate contamination, they must be informed about the issues. They must know what concentration of nitrate is in their private water supply well, what the potential health risks, are and how to protect themselves and their water supply. The following recommendations address these issues.

- Distribute Information on Nitrate Contamination—Due to the number of past testing programs, many residents have the impression that the county or the District (often viewed as one in the same) will test their well water when testing is needed. Residents need to be informed that if they have a private water supply well, they are responsible for establishing their own monitoring program. It is recommended that the District stress the importance of regular monitoring of the drinking water from private supply wells. The public should be flooded with information on the potential health risks associated with consuming elevated concentrations of nitrate, on alternative water supplies and available treatment options, and on actions they can take to protect themselves and their water supply. Perhaps information notices can be sent in the annual water production statements. Time Frame: Yearly, beginning in 1999.

- Repeat District Testing Program—If nitrate concentrations continue to rise, it is recommended that the District repeat this testing program in 3 to 5 years to reach more people as well as to continue to supplement the nitrate database. Without knowledge of the actual nitrate concentrations, well water users cannot make educated decisions to reduce their exposure to unsafe levels. In order to reach more people, it is advisable that during future testing programs the notifications are mailed to the billing address of the registered well owner, rather than to a site address from an incomplete database. Time Frame: Implement in 3 to 5 years.

- Produce and Distribute Water Supply Well Guide—Based on discussions with residents during this program, many residents lack knowledge about well construction, maintenance, operation, and general groundwater quality issues. This lack of knowledge can contribute to unnecessary exposure to contaminants as well as to the contamination of groundwater (e.g., infrequent or inadequate testing, missing well cap plugs, cracked and missing concrete pedestals, chemical storage containers in well houses, and wells within animal enclosures). The District should develop a comprehensive guide to well ownership. The guide could be distributed with the annual water production statements. This document could also be distributed to Realtors in the county for their clients who purchase a home with a private water supply well. Time Frame: Complete in 1999 calender year.

Recommendations to Reduce Nitrate Loading

Most people do not intentionally contaminate their groundwater resources. One of the best ways to prevent contamination is to educate the public about the effects they have on the environment and to equip them with tools to modify their actions. The number and distribution of nitrate sources within the study area make it impossible to link nitrate contamination to any particular source. The recommendation is to reduce all nitrate loading by educating everyone who may contribute. Recommendations for educating the three main sources of nitrate loading in the county are listed below.

Fertilizer Applications

- Provide Mobile Irrigation Lab Services—Mobile Irrigation Labs operate throughout the state to assess irrigation systems and make recommendations for improvement. The District's Mobile Lab Services will help educate the agricultural community about proper irrigation practices to reduce nitrate leaching. An inefficient irrigation system is as much a cause of excessive leaching of fertilizer nitrate into the groundwater as is excessive fertilizer application. The mobile lab will evaluate the irrigation system for distribution uniformity and efficiency and make recommendations for improvement. The mobile lab will also demonstrate some quick on-site nitrate tests for soil and irrigation water to help farmers better manage their fertilizer applications. Time Frame: The Mobile Lab began evaluations in October 1998.

- Coordinate Hands-On Workshop—The best way to learn something is to practice it. A hands-on workshop is the best way to demonstrate the quick on-site nitrate tests and their application to fertilizer management decisions. If growers can practice the new "quick-tests" on soils tested by a certified soil lab, their confidence in the accuracy of the tests may improve. In addition, the calculation used to convert measured nitrate levels to fertilizer management decisions can be complicated. Practicing the application of the test results to management decisions without risking crop yields will help farmers accept the new techniques. A similar workshop should be organized for the residential fertilizer applicator. Time Frame: A workshop for the agricultural community is scheduled for mid-January 1999.

- Provide Nitrate Test Tools—The field test kits are comprised of several different components purchased from different suppliers making it inconvenient for an individual to purchase and use them. Other counties have provided partial test kits free of charge. The District should consider doing this as well (cost $40 to $70 per complete kit). Time Frame: January 1999.

- Coordinate Field Demonstrations—Field demonstrations, using the quick tests to make management decisions, will also increase the acceptance of the new procedures. These demonstrations should be conducted with the local Cooperative Extension or other agricultural expert. Separate demonstrations should be planned for agricultural and residential fertilizer applicators. Time Frame: A field demonstration for the agricultural community is scheduled for March 1999.

- Complete Grower Survey—Grower surveys will determine what nitrate management practices are being implemented and where future educational efforts need to be focused. Questions should include: Do they use soil nitrate levels in their management decisions? Have they had an irrigation evaluation? How would they like to receive information about new technologies? What prevents them from adopting new technologies? The surveys will help the District, as well as other agricultural agencies, determine how effective educational programs have been and how to improve future outreach efforts. Time Frame: To be evaluated for implementation in the next 3 to 5 years.

- Provide Incentives Program—An incentives program will increase adoption of BMPs. In some areas of the country, fertilizer savings from implementing BMPs are

enough incentive for farmers to change. In Santa Clara County, fertilizer costs are a relatively small part of the operating expense and crop yield drops can be a relatively large expense. In order to offset the perceived economic risk, one idea is for the District to work with the Cooperative Extension and other agricultural experts to develop a list of BMPs. BMPs could then be scored for relative importance to protecting the groundwater, similar to the scoring system developed by the Technical Advisory Committee for Plant and Nutrient Management. If a farmer demonstrates a certain number of best management points, then he or she would be placed in a lower water rate category, receive a placard of recognition in the community, or other form of reward. Time Frame: To be evaluated for implementation in the next 3 to 5 years.

Animal Enclosures

- Research, Produce, and Distribute Manure Management Guide—Manure management guidelines should be researched and produced for large scale cattle and chicken operations, as well as the small domestic enclosures. Large operations are under the jurisdiction of the Regional Water Quality Control Board and should comply with their management guidelines. Domestic animal owners are not regulated except by zoning requirements. Most of the domestic animal owners surveyed dispose of their manure by leaving it where it falls or spreading it on the ground. A few haul it off site to a compost or agricultural operation. Research should include a determination of what percentage of manure spread on the ground volatilizes, denitrifies, and is taken up by plants. In addition, how much land is needed for natural attenuation of the manure nitrate to occur in all seasons. Time Frame: To be evaluated for implementation in the next 3 to 5 years.

- Coordinate Demonstration Manure Management—If it is determined that the current manure management practices are contributing to the nitrate contamination in the groundwater, establish a central manure compost area. This central area would also serve as a demonstration of proper manure management techniques. Time Frame: To be evaluated for implementation in the next 3 to 5 years.

Septic Systems

- Research the Feasibility and Practicality of Increasing the Number of Sewer Connections—Investigate the feasibility and potential benefits of increasing the number of sewer connections in the study area. This investigation should include studies into how much nitrate is being contributed by septic systems. How large does a parcel need to be for natural attenuation to occur. How much nitrate loading will be eliminated by removing or reducing septic system sources. Some of these parameters were addressed in the San Martin Area Water Quality Study (1981) and can be applied to the entire study area. Finally, investigations need to include the economic and political ramifications of increasing the sewer line connections. Time Frame: To be evaluated for implementation in the next 3 to 5 years.

Recommendations to Monitor Nitrate Occurrence

It is important to continue to monitor nitrate occurrence. Nitrate concentrations should be tracked to determine if there is any improvement. If concentrations continue to increase, the District may need to take further steps to protect the public health and the health of the groundwater resource.

- Establish and Sample a Network of Wells—The District will establish a network of approximately 50 wells to monitor areal, vertical, and temporal nitrate occurrence. The wells will be monitored quarterly for the first few years to look at seasonal variation. If no seasonal variation is observed, the monitoring frequency will be reduced to semiannually or annually. The vertical profile will aide in mapping the "nitrate plume." The shallow wells should be affected first by nitrate loading and should be affected first by the reduction of nitrate loading. Time Frame: Begin sampling in early 1999.

- Install and Monitor Shallow Monitoring Wells—Due to a lack of private supply wells with known construction only in the shallow groundwater, the District should install some shallow monitoring wells throughout the study area. One of the advantages of using District-owned wells is continued access over the years. Time Frame: Begin installations in 1999 and complete in 2000.

- Monitor Vadose Zone—Due to the slow speed with which groundwater moves, it may take several decades to affect measurable changes in the nitrate concentrations within the water table. In order to assess the effectiveness of changes in nitrate loading in a more timely manner, monitoring the concentrations within the vadose zone should be established. More research needs to be conducted on the feasibility of monitoring the vadose zone throughout the study area. Time Frame: To be evaluated for implementation in the next 3 to 5 years.

Recommendations to Remediate Nitrate Contamination

It may take decades for the existing nitrate contamination to naturally attenuate. Concentrations may continue to rise for several decades even if all sources of nitrate contamination were eliminated. In order to improve the nitrate concentrations within the groundwater basins in a timely manner, it may be necessary to actively remediate the contamination. Several possibilities exist: flushing through additional recharge, pump and treat, phytoremediation, and reactive zone remediation. All of these processes should be investigated further to determine their feasibility; practically, economically, and politically.

- Research the Feasibility and Practicality of Increasing Groundwater Recharge—There is already some indication that nitrate concentrations around areas of high recharge are lower than the surrounding area. By increasing the basin recharge with high-quality water in additional areas, the District may be able to flush the nitrate through the system faster. Time Frame: To be evaluated for implementation in the next 3 to 5 years.

- Research the Feasibility and Practicality of Pump and Treat—Along a similar theory, by pumping out the nitrate contaminated water, treating it, and reinjecting it into the basin, the District may be able to reduce the nitrate concentrations at least in the vicinity of the recharge. Time Frame: To be evaluated for implementation in the next 3 to 5 years.

- Research the Feasibility and Practicality of Phytoremediation—Phytoremediation deals with establishing plantings throughout the basin to take up the nitrate. Some plant species

have deep root systems to draw the nitrate out of the vadose zone before it reaches the water table. The plants can also be planted along buffer strips at the edge of agricultural fields to reduce runoff and erosion from the fields. Time Frame: To be evaluated for implementation in the next 3 to 5 years.

- Research the Feasibility and Practicality of Reactive Zone Remediation—Reactive zone remediation is a new technology in which a reagent is injected into the system to intercept and immobilize or degrade the nitrate into a harmless end product. For example, some form of sugar (such as molasses) is injected to increase the bacterial population to denitrify the nitrate as it passes through. The investigation into this technology should also include a study of the effects of altering the system in this manner. Time Frame: To be evaluated for implementation in the next 3 to 5 years.

SUMMARY OF RECOMMENDATIONS

Recommendation	Purpose	Target	Time Frame
To Reduce Nitrate Exposure			
Distribute Information on Nitrate Contamination	Inform private well water users of importance of regular water quality monitoring. Emphasize private responsibility of testing.	Well Owners	Yearly, beginning in 1999
Repeat District Testing Program	Inform well water users of nitrate concentration in drinking water. Provide education on nitrate issues.	Private Well Water Users	In 3-5 years
Produce & Distribute Water Supply Well Guide	Educate well owners on proper water well maintenance, testing and operation.	Well Owners	1999
To Reduce Nitrate Loading			
Provide Mobile Irrigation Lab Services	Improve irrigation and nutrient management practices	Agricultural Community	October, 1998
Coordinate Hands-on Workshop	Demonstrate soil nitrate "quick-tests" for improved nutrient management	Fertilizer Applicators	January, 1999
Provide Nitrate Test Tools	Improve nutrient management practices	Fertilizer Applicators	January, 1999
Coordinate Field Demonstration	Improve irrigation and nutrient management practices	Fertilizer Applicators	March 1999
Complete Grower Survey	Determine where future educational efforts should be focused	Agricultural Community	Future Consideration
Provide Incentives Program	Increase implementation of BMPs	Agricultural Community	Future Consideration
Research, Produce & Distribute Manure Management Guide	Determine BMPs for animal waste and educate animal owners	Animal Owners	Future Consideration
Coordinate Demonstration Manure Management	Educate animal owners on BMPs for animal waste	Animal Owners	Future Consideration
Research Feasibility & Practicality of Increasing Sewer Connections	Reduce the amount of nitrate loading from septic systems	Septic System Owners, Communities of Morgan Hill, Gilroy, and San Martin	Future Consideration
To Monitor Nitrate Occurence			
Establish & Sample a Network of Wells	Monitor nitrate occurrence areally, vertically, and seasonally. Assess the condition of the groundwater supplies	Llagas & Coyote Groundwater Basins	Early 1999
Install & Monitor Shallow Monitoring Wells	Monitor nitrate occurrence in the shallow groundwater	Llagas & Coyote Groundwater Basins	1999-2000
Monitor Vadose Zone	Monitor affects of nitrate management program on nitrate loading	Llagas & Coyote Groundwater Basins	Future Consideration
To Remediate Nitrate Contamination			
Research the Feasibility and Practicality of Increasing Groundwater Recharge	Flush the nitrate through the system faster	Llagas & Coyote Groundwater Basins	Future Consideration
Research the Feasibility and Practicality of Pump & Treat	Remove the nitrate from the groundwater and recharge the basins with the cleaned water	Llagas & Coyote Groundwater Basins	Future Consideration
Research the Feasibility and Practicality of Phytoremediation	Remove the nitrate from the vadose zone through uptake by plants	Llagas & Coyote Groundwater Basins	Future Consideration
Research the Feasibility and Practicality of Reactive Zone Remediation	Remove the nitrate from the groundwater by increasing denitrification.	Llagas & Coyote Groundwater Basins	Future Consideration

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APPENDIX A
Maps

Santa Clara County

Geologic Areas

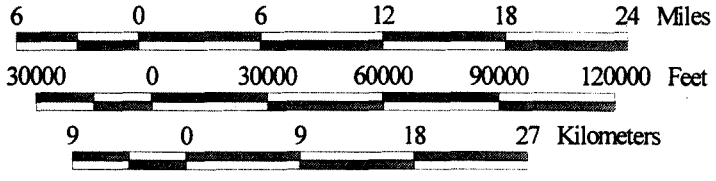




California

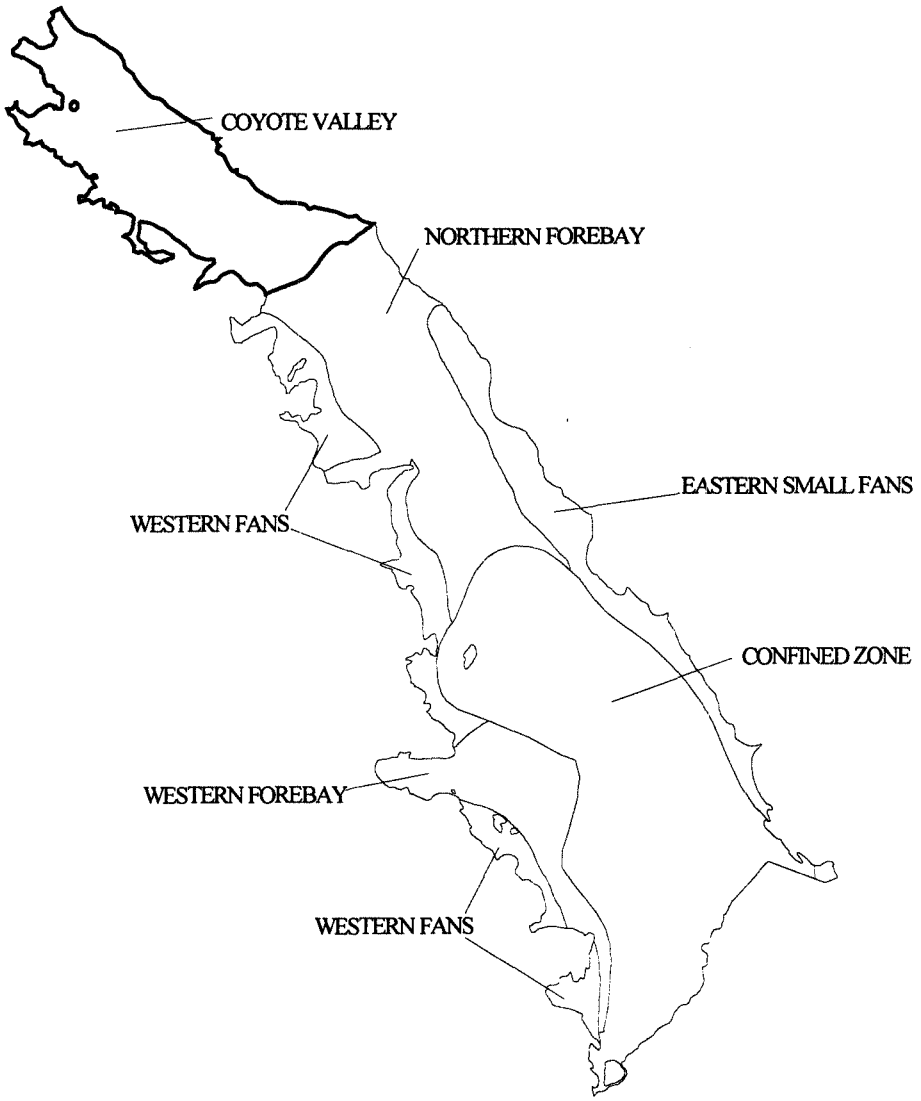


Scale 1 : 600,000



Coyote and Llagas Groundwater Basins

Subunits



Llagas Groundwater Basin

Coyote Groundwater Basin

Scale 1 : 240,000

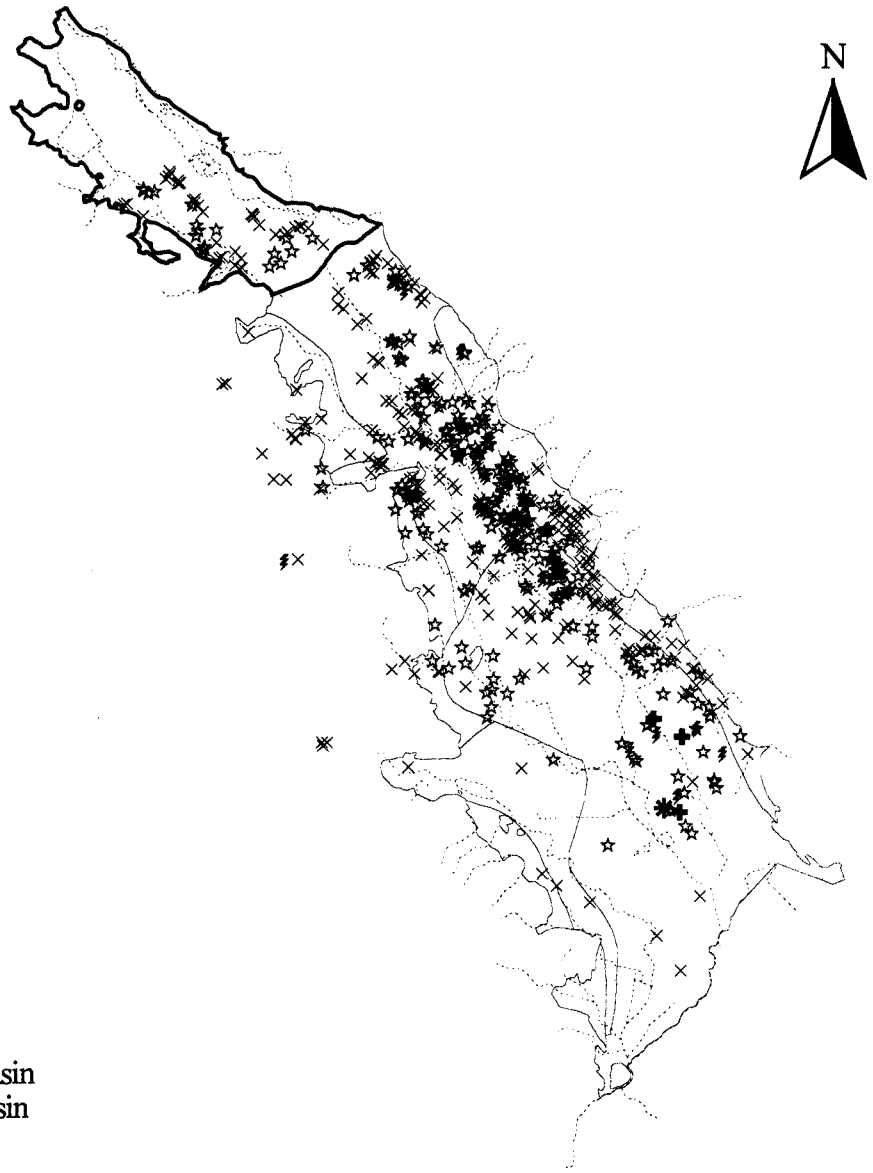
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2 0 2 4 6 8 Miles

3 0 3 6 9 12 Kilometers

Santa Clara Valley Water District

Results - 1998



Nitrate Concentration (mg/L)

- × 0 - 45
- ☆ 45.1 - 90
- ⚡ 90.1 - 135
- ✚ 135.1 - 180
- ✱ 180.1 - 225
- Coyote Groundwater Basin
- Llagas Groundwater Basin
- Creek

Scale 1 : 240,000

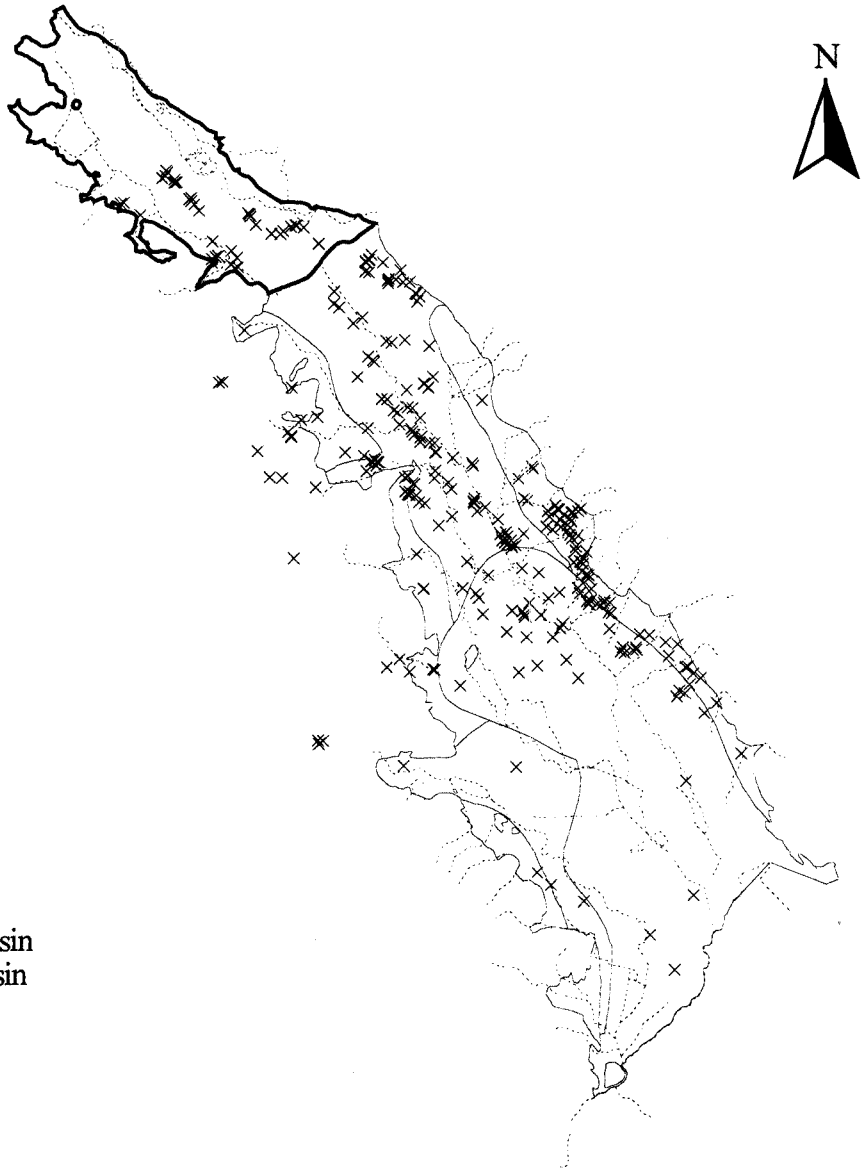
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3 0 3 6 9 12 Kilometers

Santa Clara Valley Water District

Results - 1998
Wells Less Than 45 mg/L Nitrate



Nitrate Concentration (mg/L)
× 0 - 45
Coyote Groundwater Basin
Llagas Groundwater Basin
Creek

Scale 1 : 240,000

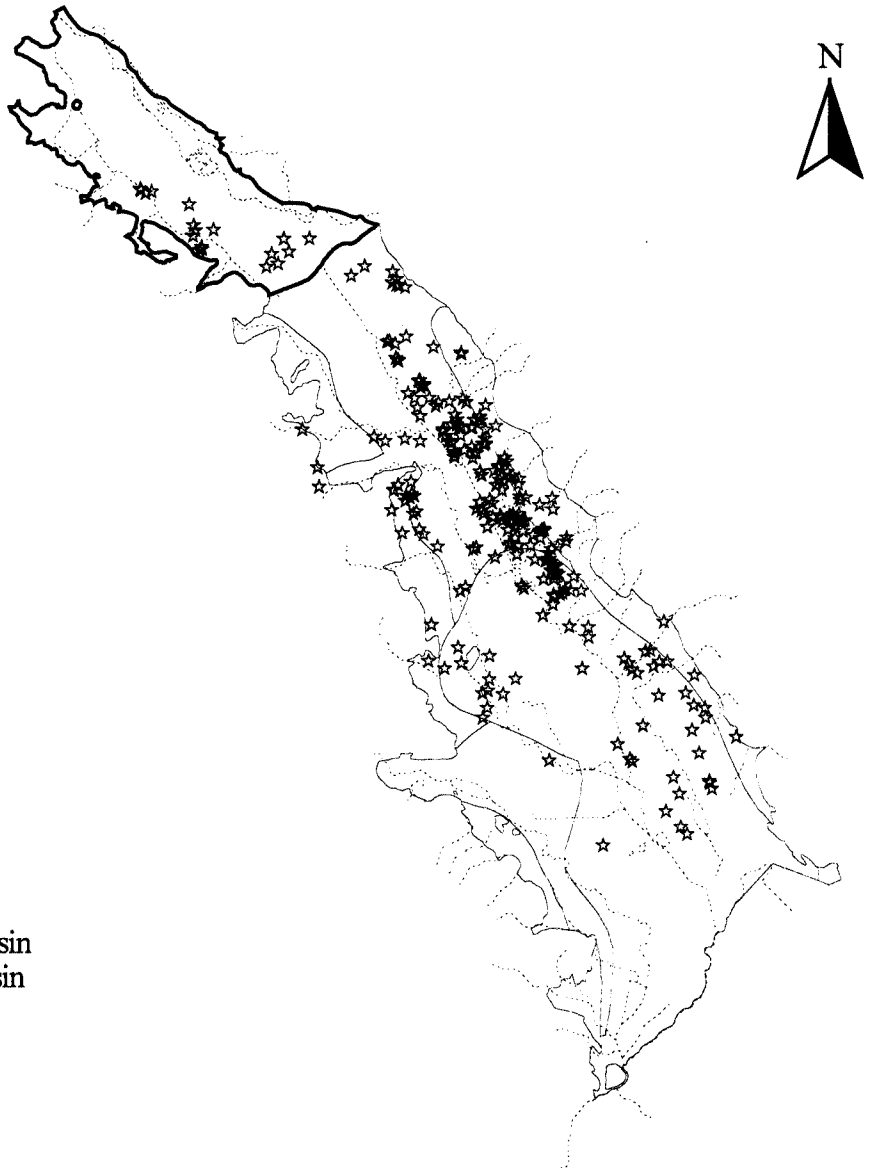
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3 0 3 6 9 12 Kilometers

Santa Clara Valley Water District

Results - 1998
Wells 45.1 - 90 mg/L Nitrate



Nitrate Concentration (mg/L)
- ☆ 45.1 - 90
- Coyote Groundwater Basin
- Llagas Groundwater Basin
- Creek

Scale 1 : 240,000

10000 0 10000 20000 30000 40000 50000 Feet

2 0 2 4 6 8 Miles

3 0 3 6 9 12 Kilometers

Santa Clara Valley Water District

Results - 1998
Wells Greater Than 90 mg/L Nitrate



Nitrate Concentration (mg/L)
- 90.1 - 135
- 135.1 - 180
- 180.1 - 225
- Coyote Groundwater Basin
- Llagas Groundwater Basin
- Creek

Scale 1 : 240,000

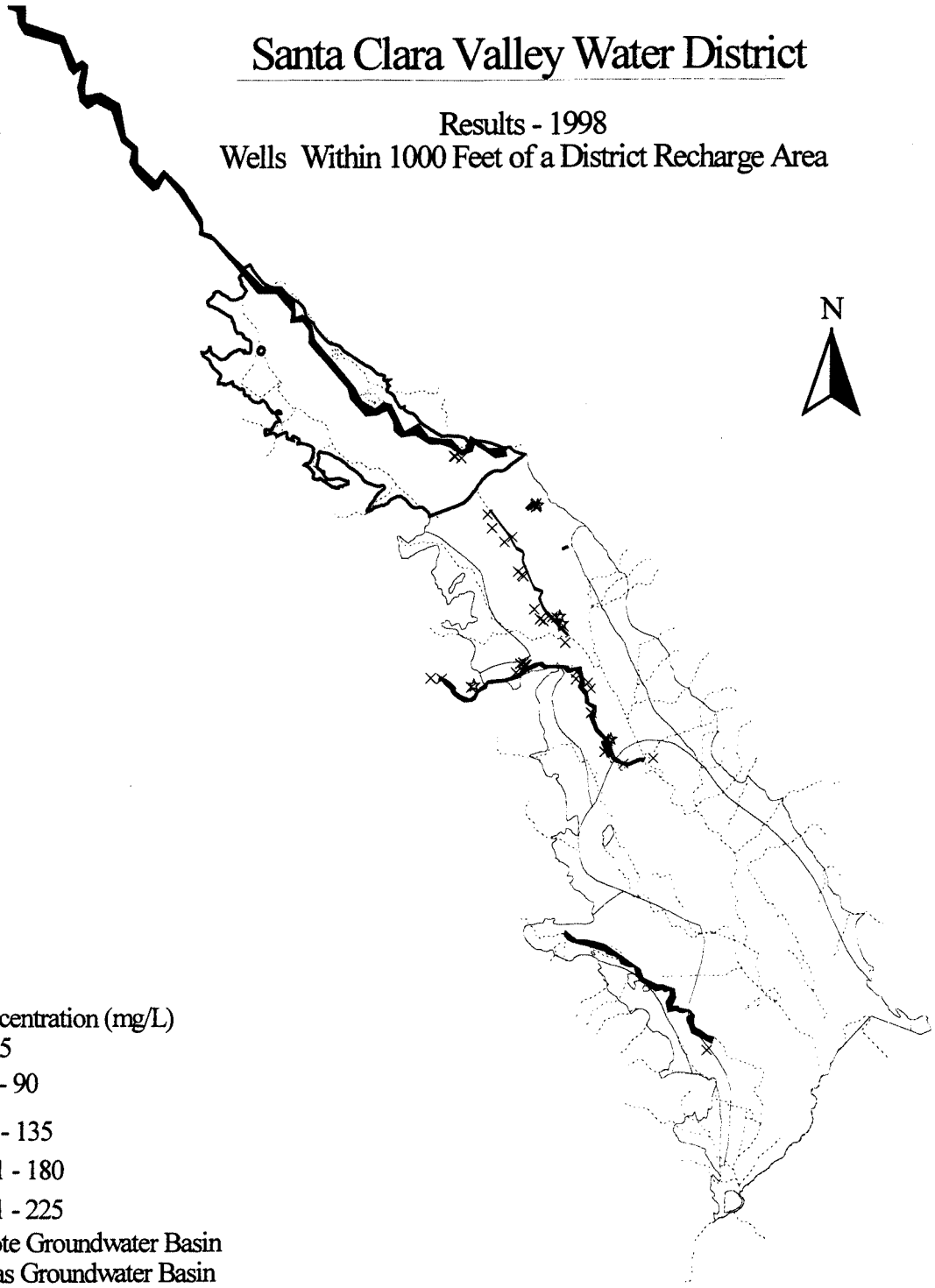
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2 0 2 4 6 8 Miles

3 0 3 6 9 12 Kilometers

Santa Clara Valley Water District

Results - 1998
Wells Within 1000 Feet of a District Recharge Area



Nitrate Concentration (mg/L)
- × 0 - 45
- ☆ 45.1 - 90
- ⚡ 90.1 - 135
- ✚ 135.1 - 180
- ✱ 180.1 - 225

Coyote Groundwater Basin
Llagas Groundwater Basin
Creek
District Recharge Area

Scale 1 : 240,000

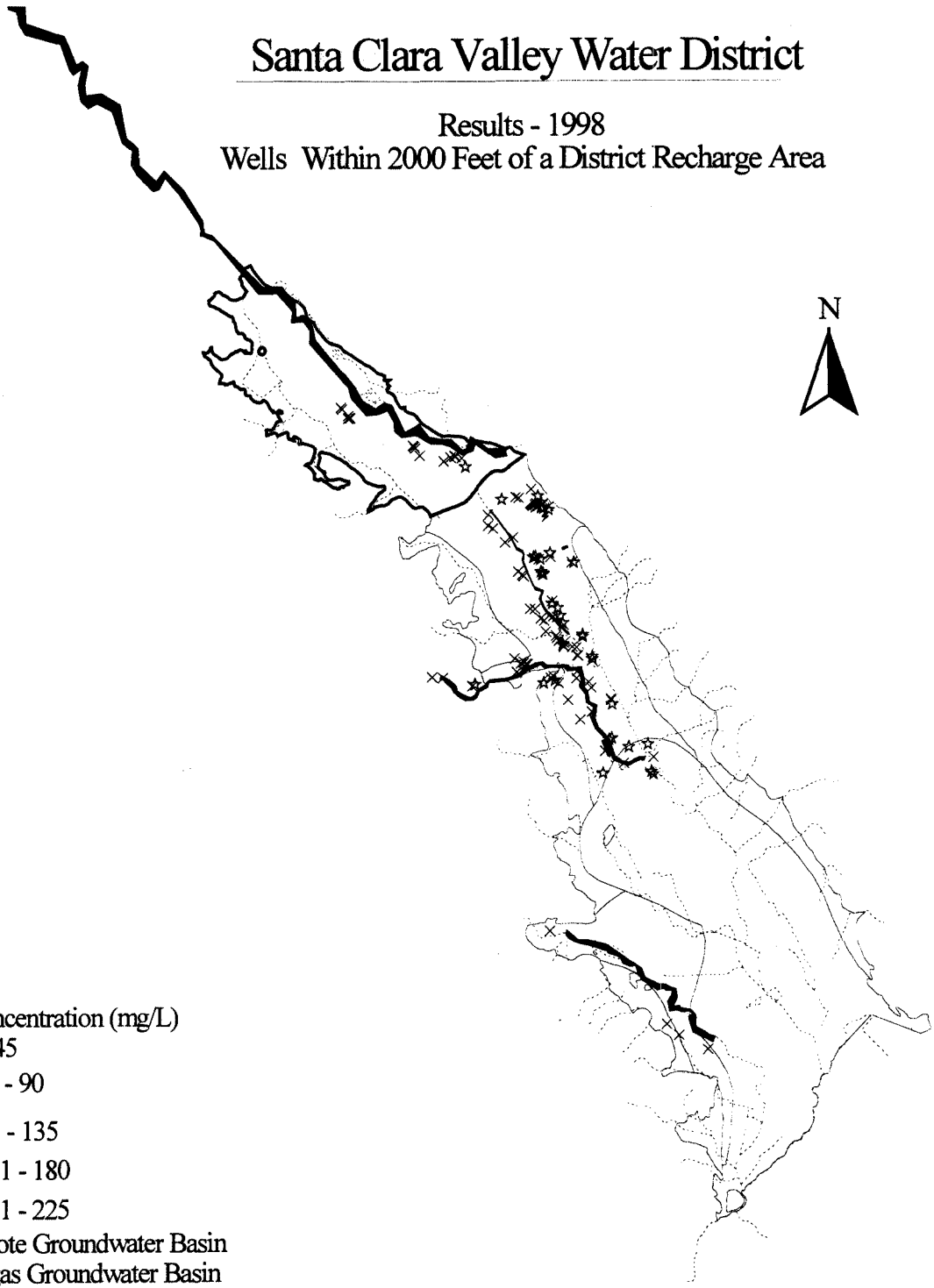
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2 0 2 4 6 8 Miles

3 0 3 6 9 12 Kilometers

Santa Clara Valley Water District

Results - 1998
Wells Within 2000 Feet of a District Recharge Area



Nitrate Concentration (mg/L)
- × 0 - 45
- ☆ 45.1 - 90
- ⚡ 90.1 - 135
- ✚ 135.1 - 180
- ✱ 180.1 - 225
- Coyote Groundwater Basin
- Llagas Groundwater Basin
- Creek
- District Recharge Area

Scale 1 : 240,000

10000 0 10000 20000 30000 40000 50000 Feet

2 0 2 4 6 8 Miles

3 0 3 6 9 12 Kilometers

APPENDIX B
Santa Clara Valley Water District
Private Well Water Testing Program—1998 Data

Santa Clara Valley Water District
Private Well Water Testing Program - Nitrate Data 1998

State Well Number	Date Sampled	Nitrate Conc. mg/L	State Well Number	Date Sampled	Nitrate Conc. (mg/L)	State Well Number	Date Sampled	Nitrate Conc. mg/L
09S02E01K006	01/26/1998	8.7	09S02E01L004	05/12/1998	12.4	09S02E01L005	01/12/1998	9.4
09S02E01L011	05/12/1998	22.3	09S02E01M003	08/24/1998	22.0	09S02E01N010	06/15/1998	67.7
09S02E01P003	05/12/1998	31.9	09S02E01Q012	05/12/1998	27.3	09S02E01Q014	01/26/1998	11.5
09S02E02R003	05/12/1998	86.5	09S02E02R008	06/01/1998	78.9	09S02E02R010	06/01/1998	68.2
09S02E11B004	05/12/1998	3.1	09S02E11C004	05/12/1998	0.7	09S02E11G003	05/12/1998	-0.1
09S02E11H008	02/03/1998	4.7	09S02E12A002	03/31/1998	12.4	09S02E12A006	05/12/1998	38.0
09S02E12A007	07/15/1998	27.1	09S02E12A010	05/18/1998	53.1	09S02E12H004	05/18/1998	44.8
09S02E12J005	05/12/1998	79.6	09S02E12J012	05/12/1998	78.2	09S02E12R010	05/18/1998	51.7
09S02E12R014	05/26/1998	-0.1	09S02E13A003	01/12/1998	46.6	09S02E13A004	01/12/1998	51.9
09S03E07H004	03/31/1998	8.5	09S03E07H005	05/19/1998	8.0	09S03E07H006	06/15/1998	4.8
09S03E07M005	05/18/1998	57.2	09S03E07N005	06/15/1998	38.7	09S03E08J002	05/19/1998	14.2
09S03E08J009	02/02/1998	3.5	09S03E08J013	02/02/1998	4.7	09S03E08M002	02/10/1998	4.6
09S03E08P004	06/01/1998	40.6	09S03E08Q002	05/19/1998	49.2	09S03E08Q003	05/26/1998	14.1
09S03E08Q005	03/02/1998	38.8	09S03E09M003	06/01/1998	14.9	09S03E09N002	05/19/1998	46.4
09S03E09P001	07/15/1998	32.1	09S03E14M002	01/21/1998	30.7	09S03E14N001	01/14/1998	31.6
09S03E14N003	02/02/1998	36.3	09S03E15C002	01/21/1998	9.8	09S03E15E004	02/10/1998	21.1
09S03E15E005	01/14/1998	47.2	09S03E15F003	01/21/1998	8.2	09S03E15F004	07/15/1998	18.9
09S03E15F005	01/26/1998	8.8	09S03E15G009	01/21/1998	33.8	09S03E15G010	01/20/1998	46.2
09S03E15H005	01/14/1998	17.5	09S03E15J001	01/26/1998	44.2	09S03E15J005	01/21/1998	51.4
09S03E15J005	06/15/1998	53.8	09S03E15J012	01/26/1998	51.7	09S03E15K004	02/10/1998	20.7
09S03E15K006	01/21/1998	37.9	09S03E15K008	01/14/1998	41.5	09S03E15K009	01/20/1998	91.5
09S03E15L007	03/23/1998	21.0	09S03E15M001	01/21/1998	24.4	09S03E15R003	01/26/1998	38.2
09S03E15R007	02/02/1998	45.1	09S03E15R010	06/15/1998	51.2	09S03E15R014	01/26/1998	45.8
09S03E16J002	01/21/1998	56.8	09S03E16Q002	01/26/1998	3.7	09S03E17B005	05/26/1998	61.1
09S03E17C003	05/19/1998	48.0	09S03E17F003	05/19/1998	51.1	09S03E17F006	05/26/1998	69.0

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State Well Number	Date Sampled	Nitrate Conc. mg/L	State Well Number	Date Sampled	Nitrate Conc. (mg/L)	State Well Number	Date Sampled	Nitrate Conc. mg/L
09S03E18B010	05/18/1998	41.5	09S03E18C003	08/24/1998	24.0	09S03E18C005	05/26/1998	36.6
09S03E18D008	01/12/1998	48.8	09S03E18E001	01/26/1998	0.8	09S03E18E005	08/24/1998	1.0
09S03E18G002	05/18/1998	28.8	09S03E18G006	04/07/1998	35.9	09S03E18G013	06/01/1998	39.6
09S03E18G014	05/18/1998	-0.1	09S03E18G015	05/18/1998	1.2	09S03E19J005	01/21/1998	26.5
09S03E21B005	01/21/1998	7.5	09S03E21B005	01/26/1998	8.0	09S03E21G004	01/26/1998	7.7
09S03E21J003	06/01/1998	15.2	09S03E22E001	01/21/1998	14.7	09S03E22Q003	03/16/1998	45.7
09S03E22Q004	01/20/1998	16.6	09S03E22Q005	01/20/1998	58.7	09S03E22R004	02/02/1998	52.0
09S03E22R007	01/20/1998	42.1	09S03E23C005	01/14/1998	25.5	09S03E23D004	01/14/1998	40.6
09S03E23N003	01/20/1998	12.2	09S03E23N004	01/20/1998	51.4	09S03E25D004	07/08/1998	47.4
09S03E25D006	02/03/1998	79.5	09S03E25D008	07/30/1998	96.0	09S03E26B006	01/26/1998	75.2
09S03E26C007	02/02/1998	15.7	09S03E26K007	02/23/1998	22.5	09S03E26L005	01/26/1998	63.2
09S03E26L007	02/02/1998	61.3	09S03E26N008	01/12/1998	54.9	09S03E26N011	02/17/1998	43.5
09S03E26P001	02/23/1998	69.6	09S03E26P003	02/23/1998	37.5	09S03E26P004	01/13/1998	25.4
09S03E26P005	08/24/1998	45.0	09S03E26P010	04/07/1998	57.0	09S03E26P013	02/10/1998	65.9
09S03E26P014	02/23/1998	66.4	09S03E27A006	05/04/1998	46.3	09S03E27C010	02/17/1998	10.7
09S03E27F006	02/17/1998	8.1	09S03E27F007	02/17/1998	6.4	09S03E27H003	02/23/1998	58.0
09S03E27H004	02/10/1998	50.4	09S03E27H006	02/17/1998	53.3	09S03E27M008	02/17/1998	30.5
09S03E29R004	02/10/1998	18.0	09S03E30P003	01/13/1998	16.4	09S03E30P007	07/14/1998	20.0
09S03E32J002	05/04/1998	2.0	09S03E32J013	02/10/1998	51.9	09S03E32K001	02/10/1998	32.0
09S03E32Q002	05/26/1998	16.3	09S03E32R003	06/01/1998	4.9	09S03E33F002	02/10/1998	34.6
09S03E34B011	02/09/1998	15.6	09S03E34B012	02/17/1998	31.2	09S03E34H004	06/01/1998	15.2
09S03E34H008	01/13/1998	14.5	09S03E34J003	02/17/1998	38.0	09S03E34L009	03/02/1998	38.1
09S03E34P001	02/24/1998	68.7	09S03E34Q003	02/24/1998	55.3	09S03E34R011	02/09/1998	48.3
09S03E35A007	02/23/1998	79.0	09S03E35B001	02/17/1998	70.9	09S03E35B003	02/17/1998	76.3
09S03E35C010	02/23/1998	65.5	09S03E35D004	02/17/1998	68.6	09S03E35D005	05/11/1998	16.5

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State Well Number	Date Sampled	Nitrate Conc. mg/L	State Well Number	Date Sampled	Nitrate Conc. (mg/L)	State Well Number	Date Sampled	Nitrate Conc. mg/L
09S03E35D007	05/04/1998	65.5	09S03E35E012	03/02/1998	23.9	09S03E35F006	01/26/1998	45.6
09S03E35F008	02/17/1998	27.5	09S03E35H0011	03/09/1998	89.2	09S03E35H005	02/23/1998	79.8
09S03E35H010	02/09/1998	85.0	09S03E35J004	04/20/1998	69.1	09S03E35K004	02/17/1998	67.7
09S03E35K008	03/10/1998	89.2	09S03E35M005	03/02/1998	17.5	09S03E35M012	02/17/1998	16.8
09S03E35N007	03/16/1998	17.0	09S03E35P003	02/24/1998	42.8	09S03E35P006	02/24/1998	40.4
09S03E35P012	03/16/1998	30.7	09S03E35P015	02/24/1998	22.6	09S03E35P016	02/09/1998	58.2
09S03E35Q001	03/02/1998	21.7	09S03E35R011	02/23/1998	75.3	09S03E35R017	01/26/1998	69.9
09S03E36B002	02/23/1998	51.7	09S03E36B006	03/23/1998	41.4	09S03E36D001	03/02/1998	83.1
09S03E36D007	04/14/1998	61.6	09S03E36F014	02/23/1998	80.0	09S03E36F015	02/23/1998	78.4
09S03E36F016	03/02/1998	79.7	09S03E36F018	01/27/1998	86.5	09S03E36J002	03/02/1998	52.2
09S03E36K009	01/13/1998	88.1	09S03E36L004	04/07/1998	80.2	09S03E36L012	02/23/1998	69.3
09S03E36M002	03/02/1998	68.8	09S03E36M003	03/09/1998	103.0	09S03E36M007	02/23/1998	67.8
09S03E36M009	04/20/1998	82.5	09S03E36N004	03/09/1998	52.1	09S03E36P005	02/23/1998	61.0
09S03E36Q002	02/09/1998	74.3	09S03E36Q004	03/09/1998	73.6	09S03E36Q006	02/23/1998	93.5
09S03E36Q008	02/17/1998	68.8	09S03E36Q013	03/16/1998	80.5	10S03E01A006	05/04/1998	59.4
10S03E01A007	03/10/1998	74.5	10S03E01A010	05/04/1998	71.0	10S03E01A011	05/04/1998	12.4
10S03E01AE007	03/16/1998	44.6	10S03E01C011	03/09/1998	66.7	10S03E01C013	03/09/1998	72.1
10S03E01C014	02/17/1998	65.4	10S03E01C016	03/02/1998	103.3	10S03E01D007	03/09/1998	78.5
10S03E01F006	03/09/1998	42.8	10S03E01F007	03/30/1998	42.2	10S03E01F010	03/02/1998	47.1
10S03E01G004	03/30/1998	57.0	10S03E01H004	03/09/1998	69.0	10S03E01H005	03/02/1998	84.8
10S03E01H008	03/09/1998	72.7	10S03E01J001	04/06/1998	71.5	10S03E01J004	06/15/1998	87.0
10S03E01J006	03/09/1998	96.7	10S03E01J009	03/09/1998	97.1	10S03E01J010	03/30/1998	87.1
10S03E01K005	03/24/1998	71.6	10S03E01K006	03/02/1998	107.4	10S03E01Q005	07/14/1998	54.3
10S03E01R005	03/09/1998	65.7	10S03E01R006	03/09/1998	129.7	10S03E02A001	03/10/1998	55.9
10S03E02A003	03/02/1998	78.0	10S03E02A007	03/16/1998	67.4	10S03E02A009	05/04/1998	35.8

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State Well Number	Date Sampled	Nitrate Conc. mg/L	State Well Number	Date Sampled	Nitrate Conc. (mg/L)	State Well Number	Date Sampled	Nitrate Conc. mg/L
10S03E02B002	03/10/1998	34.7	10S03E02B004	03/10/1998	26.8	10S03E02G005	03/10/1998	26.2
10S03E02J007	01/27/1998	44.0	10S03E02K011	03/10/1998	22.9	10S03E02M004	03/10/1998	50.3
10S03E02M005	03/16/1998	23.7	10S03E02M006	03/16/1998	11.9	10S03E02M007	03/10/1998	25.1
10S03E02N002	02/09/1998	38.3	10S03E02N003	03/10/1998	27.4	10S03E02N005	03/10/1998	85.0
10S03E02N008	03/16/1998	82.8	10S03E02N009	03/10/1998	44.8	10S03E02N010	03/10/1998	63.6
10S03E02N011	03/16/1998	30.9	10S03E02N012	04/07/1998	27.9	10S03E02N015	03/16/1998	53.3
10S03E02N016	07/08/1998	39.5	10S03E02N017	03/10/1998	55.5	10S03E02R006	02/03/1998	41.8
10S03E03D007	03/16/1998	15.3	10S03E03F005	03/16/1998	22.6	10S03E03F006	03/10/1998	20.2
10S03E03F008	03/10/1998	17.6	10S03E03F009	03/10/1998	14.5	10S03E03F010	03/10/1998	18.9
10S03E03F011	03/10/1998	17.0	10S03E03H002	03/10/1998	13.5	10S03E03J008	03/10/1998	49.8
10S03E03L002	03/16/1998	8.4	10S03E03R002	03/10/1998	62.0	10S03E03R009	03/16/1998	65.0
10S03E03R010	03/16/1998	92.3	10S03E04A006	05/04/1998	38.1	10S03E04F011	03/10/1998	54.8
10S03E04N004	02/10/1998	23.8	10S03E04P003	05/04/1998	68.3	10S03E05D009	06/16/1998	17.6
10S03E05K004	06/01/1998	7.0	10S03E05K013	06/01/1998	-0.1	10S03E05L004	02/09/1998	13.0
10S03E10A011	03/31/1998	51.1	10S03E10J003	03/10/1998	58.6	10S03E11C010	05/11/1998	44.0
10S03E11D010	06/02/1998	53.3	10S03E11E002	06/02/1998	47.3	10S03E11H007	03/24/1998	13.4
10S03E11K005	03/10/1998	25.3	10S03E11L002	03/10/1998	67.2	10S03E11L005	03/17/1998	49.9
10S03E11Q004	03/17/1998	45.6	10S03E12B002	03/16/1998	38.9	10S03E12B003	03/30/1998	52.9
10S03E12B004	03/09/1998	62.4	10S03E12C002	03/16/1998	44.9	10S03E12C004	02/09/1998	41.3
10S03E12C008	03/24/1998	45.9	10S03E12C009	03/16/1998	43.7	10S03E12C014	04/20/1998	57.3
10S03E12F002	05/11/1998	40.4	10S03E12G001	03/10/1998	48.8	10S03E12G013	03/09/1998	46.7
10S03E12H004	03/09/1998	48.8	10S03E12H005	03/24/1998	49.8	10S03E12H009	03/16/1998	45.3
10S03E12H016	03/24/1998	44.8	10S03E12J005	01/12/1998	44.4	10S03E12K004	03/16/1998	47.9
10S03E12P001	04/07/1998	51.5	10S03E12P003	03/17/1998	61.8	10S03E12R004	03/16/1998	44.7
10S03E12R005	04/06/1998	43.2	10S03E13A001	03/17/1998	50.2	10S03E13D002	03/17/1998	11.2

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State Well Number	Date Sampled	Nitrate Conc. mg/L	State Well Number	Date Sampled	Nitrate Conc. (mg/L)	State Well Number	Date Sampled	Nitrate Conc. mg/L
10S03E13L008	04/14/1998	16.3	10S03E13M001	04/14/1998	61.1	10S03E13N002	04/20/1998	36.8
10S03E13N005	03/17/1998	71.8	10S03E13P003	03/30/1998	13.7	10S03E13P004	03/17/1998	29.0
10S03E14C007	06/15/1998	43.1	10S03E14P002	04/20/1998	19.1	10S03E14P005	03/17/1998	19.9
1(S03E17A003	01/20/1998	43.9	10S03E17B007	08/24/1998	99.0	10S03E23G010	04/20/1998	51.2
10S03E24G008	03/17/1998	39.0	10S03E24N002	04/20/1998	49.6	10S03E25B005	08/24/1998	46.0
1(S03E25B008	07/14/1998	73.4	10S03E25E002	04/07/1998	47.4	10S03E25K003	04/13/1998	49.5
1(S03E25K009	03/17/1998	68.1	10S03E25M003	03/30/1998	40.7	10S03E25Q002	03/17/1998	58.8
1(S03E25R004	04/07/1998	86.6	10S03E26C005	03/17/1998	50.5	10S03E26E005	07/14/1998	0.2
10S03E26G001	03/17/1998	45.0	10S03E26G007	02/23/1998	38.6	10S03E26H003	04/07/1998	49.6
10S03E27A001	02/09/1998	33.5	10S03E27G001	06/16/1998	18.3	10S03E33P001	01/13/1998	18.6
10S03E33P010	03/30/1998	37.4	10S03E33P018	01/13/1998	31.3	10S03E36B003	01/27/1998	62.8
10S03E36G004	03/30/1998	47.6	10S04E06E011	03/23/1998	77.1	10S04E06F002	03/16/1998	21.3
10S04E06F005	03/23/1998	11.3	10S04E06L006	03/23/1998	42.7	10S04E06M004	03/30/1998	56.1
10S04E06M010	05/26/1998	56.2	10S04E06M015	03/23/1998	66.4	10S04E06M018	03/16/1998	60.0
10S04E06N014	06/02/1998	61.5	10S04E06N017	03/16/1998	66.6	10S04E06P004	06/15/1998	48.8
10S04E06P006	03/30/1998	44.6	10S04E06R003	04/14/1998	46.5	10S04E07A001	02/02/1998	4.2
10S04E07A003	03/16/1998	47.2	10S04E07A004	03/16/1998	7.0	10S04E07A008	02/02/1998	13.2
1(S04E07A009	03/16/1998	26.9	10S04E07B002	03/23/1998	62.6	10S04E07C001	03/16/1998	42.6
10S04E07D009	03/16/1998	136.4	10S04E07E005	03/30/1998	75.6	10S04E07E007	03/16/1998	58.9
10S04E07E009	03/24/1998	71.7	10S04E07E013	03/24/1998	78.0	10S04E07E014	03/16/1998	70.5
10S04E07E018	02/02/1998	81.3	10S04E07E019	02/02/1998	73.1	10S04E07E021	03/24/1998	69.7
10S04E07E024	04/14/1998	84.0	10S04E07E025	03/30/1998	81.8	10S04E07E030	03/24/1998	82.6
10S04E07E033	03/24/1998	55.9	10S04E07F001	03/24/1998	84.8	10S04E07F006	03/30/1998	61.5
10S04E07F015	04/20/1998	86.4	10S04E07F019	04/06/1998	72.3	10S04E07H008	03/23/1998	19.9
10S04E07H012	04/06/1998	9.9	10S04E07J001	02/03/1998	21.8	10S04E07J010	02/09/1998	34.2

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State Well Number	Date Sampled	Nitrate Conc. mg/L	State Well Number	Date Sampled	Nitrate Conc. (mg/L)	State Well Number	Date Sampled	Nitrate Conc. mg/L
10S04E07K007	04/06/1998	72.7	10S04E07K008	03/23/1998	47.6	10S04E07K010	03/23/1998	72.2
10S04E07K016	04/20/1998	47.5	10S04E07K017	04/06/1998	59.4	10S04E07K019	03/23/1998	73.5
10S04E07L003	04/14/1998	41.2	10S04E07L004	03/30/1998	76.5	10S04E07M004	02/02/1998	66.9
10S04E07M005	04/14/1998	62.2	10S04E07M007	03/24/1998	46.7	10S04E07M011	01/12/1998	49.1
10S04E07M017	04/06/1998	44.8	10S04E07M018	07/14/1998	43.2	10S04E07M020	04/14/1998	66.6
10S04E07N003	03/30/1998	43.4	10S04E07N007	03/30/1998	77.5	10S04E07N008	04/14/1998	43.3
10S04E07N011	04/20/1998	44.7	10S04E07N012	03/24/1998	46.4	10S04E07N015	04/14/1998	45.5
10S04E07N016	04/06/1998	50.6	10S04E07N020	03/31/1998	44.5	10S04E07N023	04/06/1998	44.3
10S04E07N024	03/24/1998	44.9	10S04E07P003	01/27/1998	57.4	10S04E07R009	08/24/1998	48.0
10S04E07R012	03/31/1998	59.7	10S04E08C004	03/23/1998	26.1	10S04E08D002	04/14/1998	10.7
10S04E08D003	07/14/1998	10.8	10S04E08E002	03/23/1998	8.6	10S04E08E004	03/23/1998	6.4
10S04E08E005	04/14/1998	5.3	10S04E08F006	03/23/1998	36.2	10S04E08L001	03/10/1998	10.4
10S04E08M004	02/09/1998	8.3	10S04E08M005	05/18/1998	10.3	10S04E08M007	03/23/1998	0.5
10S04E08M008	04/14/1998	48.1	10S04E08M010	03/31/1998	9.3	10S04E08N002	05/18/1998	16.0
10S04E08N006	03/23/1998	78.9	10S04E08P005	07/14/1998	2.0	10S04E17B003	04/06/1998	3.1
10S04E17C009	03/23/1998	31.7	10S04E17C012	03/23/1998	11.0	10S04E17C013	03/31/1998	3.7
10S04E17C018	04/06/1998	22.4	10S04E17E002	04/28/1998	49.2	10S04E17F002	04/28/1998	12.5
10S04E17F006	04/06/1998	31.6	10S04E17F011	04/06/1998	6.1	10S04E17G005	04/06/1998	-0.1
10S04E17G006	03/31/1998	16.8	10S04E17K001	04/06/1998	7.8	10S04E17K006	04/07/1998	7.5
10S04E17L002	04/14/1998	41.3	10S04E17M004	05/04/1998	65.7	10S04E17M007	04/07/1998	66.7
10S04E17M008	04/07/1998	65.7	10S04E17N005	04/07/1998	51.1	10S04E17N011	04/07/1998	59.7
10S04E17P004	04/28/1998	48.0	10S04E17P006	08/24/1998	37.0	10S04E17Q003	03/31/1998	31.3
10S04E17Q006	04/28/1998	34.2	10S04E18A002	04/07/1998	67.8	10S04E18A011	04/07/1998	66.5
10S04E18A014	04/07/1998	67.5	10S04E18B002	04/07/1998	51.8	10S04E18B006	04/13/1998	63.2
10S04E18B007	04/07/1998	63.3	10S04E18B008	04/13/1998	53.1	10S04E18B011	04/20/1998	62.8

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State Well Number	Date Sampled	Nitrate Conc. mg/L	State Well Number	Date Sampled	Nitrate Conc. (mg/L)	State Well Number	Date Sampled	Nitrate Conc. mg/L
10S04E18D005	04/06/1998	47.1	10S04E18F001	03/30/1998	43.4	10S04E18G011	04/07/1998	43.2
10S04E18H003	04/13/1998	60.2	10S04E18H005	04/13/1998	47.2	10S04E18H007	04/07/1998	62.2
10S04E18H008	03/31/1998	52.0	10S04E18H009	01/27/1998	53.7	10S04E18H010	04/07/1998	54.0
10S04E18H014	04/13/1998	63.3	10S04E18H015	08/24/1998	63.0	10S04E18H016	03/31/1998	69.6
10S04E18H017	04/07/1998	55.2	10S04E18J008	01/13/1998	50.0	10S04E18J008	03/10/1998	50.0
10S04E18J011	04/07/1998	50.2	10S04E18K003	05/26/1998	45.6	10S04E18K005	04/28/1998	92.4
10S04E18K006	04/13/1998	106.8	10S04E18L001	04/13/1998	47.9	10S04E18L007	04/07/1998	51.2
10S04E18R004	06/02/1998	67.4	10S04E18R007	04/28/1998	46.9	10S04E18R009	04/13/1998	42.5
10S04E18R015	04/13/1998	39.6	10S04E18R016	04/07/1998	50.7	10S04E19A005	01/27/1998	48.3
10S04E19B006	01/27/1998	48.8	10S04E19C006	05/04/1998	39.4	10S04E19C012	06/16/1998	41.8
10S04E19D013	08/24/1998	28.0	10S04E19D014	08/24/1998	30.0	10S04E19F004	04/28/1998	33.6
10S04E19F006	04/13/1998	26.9	10S04E19G006	01/27/1998	44.8	10S04E19J003	04/13/1998	45.0
10S04E19J005	04/28/1998	34.1	10S04E19L001	04/13/1998	18.6	10S04E19M006	04/07/1998	26.3
10S04E20A001	04/20/1998	13.1	10S04E20A007	04/21/1998	15.5	10S04E20A008	08/24/1998	1.0
10S04E20A009	08/24/1998	23.0	10S04E20B002	04/14/1998	22.2	10S04E20B005	04/28/1998	33.6
10S04E20B006	05/04/1998	24.6	10S04E20E002	04/28/1998	46.3	10S04E20E003	05/04/1998	43.0
10S04E20F001	04/28/1998	61.6	10S04E20H004	04/21/1998	4.4	10S04E20J005	04/14/1998	8.6
10S04E20K002	04/13/1998	46.4	10S04E21H004	04/14/1998	56.8	10S04E21K002	07/08/1998	6.4
10S04E21K008	04/21/1998	5.8	10S04E21N002	01/13/1998	36.5	10S04E21P003	04/21/1998	22.5
10S04E21P004	04/27/1998	33.5	10S04E21P006	04/14/1998	16.2	10S04E21Q004	04/14/1998	48.5
10S04E21Q007	05/04/1998	46.3	10S04E22N001	07/14/1998	15.3	10S04E27D009	04/14/1998	47.6
10S04E27E002	04/27/1998	-0.1	10S04E27F006	04/14/1998	2.3	10S04E27F007	04/14/1998	19.5
10S04E27G001	01/12/1998	12.1	10S04E27G002	07/14/1998	47.0	10S04E27K007	04/06/1998	21.7
10S04E27K008	04/14/1998	40.6	10S04E27K011	07/14/1998	19.0	10S04E27P001	01/13/1998	39.6
10S04E27P004	06/02/1998	41.0	10S04E27P007	04/27/1998	60.5	10S04E27P009	04/27/1998	13.4

Santa Clara Valley Water District
Private Well Water Testing Program - Nitrate Data 1998

State Well Number	Date Sampled	Nitrate Conc. mg/L	State Well Number	Date Sampled	Nitrate Conc. (mg/L)	State Well Number	Date Sampled	Nitrate Conc. mg/L
10S04E28A002	05/04/1998	58.6	10S04E28A006	04/14/1998	58.1	10S04E28A007	04/27/1998	29.3
10S04E28C008	04/14/1998	27.3	10S04E28D001	02/17/1998	58.5	10S04E28D002	04/21/1998	70.0
10S04E28D010	04/20/1998	30.3	10S04E28F005	04/14/1998	47.0	10S04E28F009	04/27/1998	53.9
10S04E28R001	05/05/1998	69.3	10S04E29D002	02/03/1998	41.3	10S04E29F005	04/14/1998	45.4
10S04E29L003	04/14/1998	35.0	10S04E30E004	01/27/1998	38.8	10S04E30G005	04/28/1998	22.9
10S04E30M003	04/28/1998	74.4	10S04E30N007	01/27/1998	57.3	10S04E33G003	04/21/1998	57.6
10S04E33G010	04/27/1998	118.0	10S04E33G012	04/27/1998	147.0	10S04E33J001	02/09/1998	131.0
10S04E33N001	04/27/1998	68.0	10S04E33P001	02/03/1998	109.4	10S04E34A001	04/27/1998	48.8
10S04E34A003	05/11/1998	63.7	10S04E34A005	04/27/1998	39.0	10S04E34B002	05/05/1998	48.4
10S04E34G001	06/16/1998	86.8	10S04E34K001	04/21/1998	95.8	10S04E34L007	04/21/1998	170.0
10S04E34Q004	05/11/1998	47.4	10S04E35D003	04/27/1998	15.6	10S04E35L003	06/02/1998	69.8
10S04E35L004	06/02/1998	4.0	10S04E35Q001	04/27/1998	7.3	11S03E02E001	05/04/1998	13.6
11S04E02D002	04/21/1998	103.3	11S04E03E001	04/14/1998	85.7	11S04E03F004	05/05/1998	64.4
11S04E03H001	07/14/1998	63.2	11S04E03J001	07/14/1998	52.0	11S04E03J006	04/27/1998	62.5
11S04E03K001	05/05/1998	7.2	11S04E03N013	05/11/1998	126.0	11S04E04C008	04/27/1998	64.3
11S04E04C009	04/27/1998	66.1	11S04E06A005	05/05/1998	52.3	11S04E06E001	05/04/1998	26.5
11S04E08R002	05/05/1998	84.8	11S04E09A002	01/27/1998	204.7	11S04E10D005	04/27/1998	51.6
11S04E10D014	08/24/1998	152.0	11S04E10F010	04/27/1998	45.9	11S04E10L002	05/05/1998	63.8
11S04E15Q001	05/05/1998	43.1	11S04E17P003	01/27/1998	14.7	11S04E18G001	07/08/1998	40.4
11S04E18J002	06/02/1998	15.2	11S04E21J003	07/14/1998	30.7	11S04E27D003	05/05/1998	20.4
UNREGISTERED	07/14/1998	0.2	UNREGISTERED	06/16/1998	0.6	UNREGISTERED	02/09/1998	0.8
UNREGISTERED	02/09/1998	1.2	UNREGISTERED	06/01/1998	1.3	UNREGISTERED	06/01/1998	1.6
UNREGISTERED	07/14/1998	7.1	UNREGISTERED	02/03/1998	7.9	UNREGISTERED	06/16/1998	8.9
UNREGISTERED	06/01/1998	14.8	UNREGISTERED	01/12/1998	18.5	UNREGISTERED	05/26/1998	33.4
UNREGISTERED	03/30/1998	74.3						

APPENDIX C
Santa Clara Valley Water District
Private Well Water Testing Program Quality Control Reports

QUALITY CONTROL DATA REPORT
For
Nitrate Testing Program

Sample Information/Problems:
There were no problems encountered with sample receipt.

Analytical Information/problems:
There were no problems encountered with the sample analysis.

Quality Control:
The quality control data is summarized below:

MS: A matrix spike was analyzed where applicable, and all results were acceptable. The matrix spike is an aliquot of sample fortified with known quantities of specific compounds and are subjected to the entire analytical procedure.

LCS: A laboratory control sample was analyzed where applicable, and all results were acceptable. The LCS is a control sample of known, interference-free matrix that is analyzed using the same reagents, preparation, and analytical methods employed for the sample s. If the recovery of the matrix spike does not fall within control limits due to matrix interference's, the LCS recovery is to be used to validate the batch.

DUP: A sample duplicate was analyzed where applicable, and all results were acceptable. The duplicate result is used to determine the precision of the analysis by calculating the relative percent difference.

Sample	Sample result	Spike level	Matrix Spike Result	Matrix Recovery (%)
1/14-09S03E15E005	10.65	1.00	10.70	112%
1/13-9060 NEW AVE - 1	8.25	1.00	8.55	113%
1/12-10S04E07M011- 1	12.10	1.00	12.03	114%

LCS Sample #	True Value	Actual Value	LCS Recovery (%)
3	0.51	0.50	99%
2	0.51	0.50	98%
1	0.50	0.50	99%

Sample	1st Result	Duplicate	RPD(%)
1/14-09S03E15E005	10.64	10.65	0.00
1/13-9060 NEW AVE	8.26	8.23	0.00
1/12-10S04E07M011	12.14	12.06	0.01

All units are in mg/l

R.P.D. = (1st Result - Duplicate)/(MEAN VALUE)x(100%)
% SPIKE RETURN = (Matrix Spk Result - Sple Resultx0.9)/(Spike Amount)x(100%)

QUALITY CONTROL DATA REPORT
For
Nitrate Testing Program

Sample Information/Problems:
There were no problems encountered with sample receipt.

Analytical Information/problems:
There were no problems encountered with the sample analysis.

Quality Control:
The quality control data is summarized below:

MS: A matrix spike was analyzed where applicable, and all results were acceptable. The matrix spike is an aliquot of sample fortified with known quantities of specific compounds and are subjected to the entire analytical procedure.

LCS: A laboratory control sample was analyzed where applicable, and all results were acceptable. The LCS is a control sample of known, interference-free matrix that is analyzed using the same reagents, preparation, and analytical methods employed for the sample s. If the recovery of the matrix spike does not fall within control limits due to matrix interference's, the LCS recovery is to be used to validate the batch.

DUP: A sample duplicate was analyzed where applicable, and all results were acceptable. The duplicate result is used to determine the precision of the analysis by calculating the relative percent difference.

Sample	Sample result	Spike level	Matrix Spike Result	Matrix Recovery (%)
1/20-09S03E22R007 - 1	9.50	1.00	9.711	116%
1/21-09S03E22E001 - 11	3.33	1.00	4.022	103%

LCS Sample #	True Value	Actual Value	LCS Recovery (%)
1	0.50	0.492	98%
2	0.50	0.50	100%

Sample	1st Result	Duplicate	RPD(%)
1/20-09S03E22R007 - 1	9.480	9.522	-0.4%
1/21-09S03E22E001 - 11	3.325	3.325	0.0%

QUALITY CONTROL DATA REPORT
For
Nitrate Testing Program

Sample Information/Problems:
There were no problems encountered with sample receipt.

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There were no problems encountered with the sample analysis.

Quality Control:
The quality control data is summarized below:

MS: A matrix spike was analyzed where applicable, and all results were acceptable. The matrix spike is an aliquot of sample fortified with known quantities of specific compounds and are subjected to the entire analytical procedure.

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DUP: A sample duplicate was analyzed where applicable, and all results were acceptable. The duplicate result is used to determine the precision of the analysis by calculating the relative percent difference.

Sample	Sample result	Spike level	Matrix Spike Result	Matrix Recovery (%)
1/26-09S03E15R014 -1	10.34	1.00	10.422	112%
1/26-09S03E01Q014 -11	2.59	1.00	3.353	102%
1/27-10S04E18H009 - 21	12.11	1.00	12.054	115%

LCS Sample #	True Value	Actual Value	LCS Recovery (%)
1	0.50	0.507	101%
2	0.50	0.527	105%
3			

Sample	1st Result	Duplicate	RPD(%)
1/26-09S03E15R014 -1	10.332	10.344	-0.1%
1/26-09S03E01Q014 -11	2.592	2.583	0.3%
1/27-10S04E18H009 - 21	12.12	12.107	0.1%

QUALITY CONTROL DATA REPORT

For

Nitrate Testing Program

Sample Information/Problems:
There were no problems encountered with sample receipt.

Analytical Information/problems:
There were no problems encountered with the sample analysis.

Quality Control:
The quality control data is summarized below:

MS: A matrix spike was analyzed where applicable, and all results were acceptable. The matrix spike is an aliquot of sample fortified with known quantities of specific compounds and are subjected to the entire analytical procedure.

LCS: A laboratory control sample was analyzed where applicable, and all results were acceptable. The LCS is a control sample of known, interference-free matrix that is analyzed using the same reagents, preparation, and analytical methods employed for the sample s. If the recovery of the matrix spike does not fall within control limits due to matrix interference's, the LCS recovery is to be used to validate the batch.

DUP: A sample duplicate was analyzed where applicable, and all results were acceptable. The duplicate result is used to determine the precision of the analysis by calculating the relative percent difference.

Sample	Sample result	Spike level	Matrix Spike Result	Matrix Recovery (%)
2/2-10S04E07E019 - 1	16.51	1.00	15.961	111%
2/2-09S03E22R004 -11	11.74	1.00	11.701	114%

LCS Sample #	True Value	Actual Value	LCS Recovery (%)
1	2.00	2.045	102%
2	2.00	2.046	102%
3	25.00	25.489	102%

Sample	1st Result	Duplicate	RPD(%)
2/2-10S04E07E019 - 1	16.464	16.547	-0.5%
2/2-09S03E22R004 -11	11.706	11.768	-0.5%

QUALITY CONTROL DATA REPORT
For
Nitrate Testing Program

Sample Information/Problems:
There were no problems encountered with sample receipt.

Analytical Information/problems:
There were no problems encountered with the sample analysis.

Quality Control:
The quality control data is summarized below:

MS: A matrix spike was analyzed where applicable, and all results were acceptable. The matrix spike is an aliquot of sample fortified with known quantities of specific compounds and are subjected to the entire analytical procedure.

LCS: A laboratory control sample was analyzed where applicable, and all results were acceptable. The LCS is a control sample of known, interference-free matrix that is analyzed using the same reagents, preparation, and analytical methods employed for the sample s. If the recovery of the matrix spike does not fall within control limits due to matrix interference's, the LCS recovery is to be used to validate the batch.

DUP: A sample duplicate was analyzed where applicable, and all results were acceptable. The duplicate result is used to determine the precision of the analysis by calculating the relative percent difference.

Sample	Sample result	Spike level	Matrix Spike Result	Matrix Recovery (%)
2/9-10S04E33J001 - 1	29.487	1.00	27.556	102%
2/9-10S03E27A001 -11	7.571	1.00	7.970	116%
2/9-09S03E35H010 - 21 D	19.198	1.00	18.355	108%

LCS Sample #	True Value	Actual Value	LCS Recovery (%)
1	2.00	2.013	101%
2	2.00	2.032	102%
3	25.00	25.346	101%

Sample	1st Result	Duplicate	RPD(%)
2/9-10S04E33J001 - 1	29.465	29.509	-0.1%
2/9-10S03E27A001 -11	7.564	7.578	-0.2%
2/9-09S03E35H010 - 21 D	19.196	19.200	0.0%

QUALITY CONTROL DATA REPORT

For

Nitrate Testing Program

Sample Information/Problems:
There were no problems encountered with sample receipt.

Analytical Information/problems:
There were no problems encountered with the sample analysis.

Quality Control:
The quality control data is summarized below:

MS: A matrix spike was analyzed where applicable, and all results were acceptable. The matrix spike is an aliquot of sample fortified with known quantities of specific compounds and are subjected to the entire analytical procedure.

LCS: A laboratory control sample was analyzed where applicable, and all results were acceptable. The LCS is a control sample of known, interference-free matrix that is analyzed using the same reagents, preparation, and analytical methods employed for the sample s. If the recovery of the matrix spike does not fall within control limits due to matrix interference's, the LCS recovery is to be used to validate the batch.

DUP: A sample duplicate was analyzed where applicable, and all results were acceptable. The duplicate result is used to determine the precision of the analysis by calculating the relative percent difference.

Sample	Sample result	Spike level	Matrix Spike Result	Matrix Recovery (%)
2/17-09S03E27C010 - 1	2.421	1.00	3.178	100%
2/17-09S03E35D004 - 11	15.486	1.00	15.017	108%

LCS Sample #	True Value	Actual Value	LCS Recovery (%)
1	2.00	2.020	101%
2	25.00	25.432	102%
3			

Sample	1st Result	Duplicate	RPD(%)
2/17-09S03E27C010 - 1	2.421	2.421	0.0%
2/17-09S03E35D004 - 11	15.480	15.491	-0.1%

QUALITY CONTROL DATA REPORT
For
Nitrate Testing Program

Sample Information/Problems:
There were no problems encountered with sample receipt.

Analytical Information/problems:
There were no problems encountered with the sample analysis.

Quality Control:
The quality control data is summarized below:

MS: A matrix spike was analyzed where applicable, and all results were acceptable. The matrix spike is an aliquot of sample fortified with known quantities of specific compounds and are subjected to the entire analytical procedure.

LCS: A laboratory control sample was analyzed where applicable, and all results were acceptable. The LCS is a control sample of known, interference-free matrix that is analyzed using the same reagents, preparation, and analytical methods employed for the sample s. If the recovery of the matrix spike does not fall within control limits due to matrix interference's, the LCS recovery is to be used to validate the batch.

DUP: A sample duplicate was analyzed where applicable, and all results were acceptable. The duplicate result is used to determine the precision of the analysis by calculating the relative percent difference.

Sample	Sample result	Spike level	Matrix Spike Result	Matrix Recovery (%)
2/23-09S03E26P014 - 1	14.997	1.00	14.6017	110%
2/23-09S03E36L012 - 11	15.647	1.00	15.1916	111%
2/23-09S03E35P003 21	9.663	1.00	9.858	116%

LCS Sample #	True Value	Actual Value	LCS Recovery (%)
1	1.00	1.010	101%
2	25.00	25.30	101%
3			

Sample	1st Result	Duplicate	RPD(%)
2/23-09S03E26P014 - 1	14.9697	15.0242	-0.4%
2/23-09S03E36L012 - 11	15.6445	15.6488	0.0%
2/23-09S03E35P003 21	9.66094	9.66453	0.0%

QUALITY CONTROL DATA REPORT
For
Nitrate Testing Program

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There were no problems encountered with sample receipt.

Analytical Information/problems:
There were no problems encountered with the sample analysis.

Quality Control:
The quality control data is summarized below:

MS: A matrix spike was analyzed where applicable, and all results were acceptable. The matrix spike is an aliquot of sample fortified with known quantities of specific compounds and are subjected to the entire analytical procedure.

LCS: A laboratory control sample was analyzed where applicable, and all results were acceptable. The LCS is a control sample of known, interference-free matrix that is analyzed using the same reagents, preparation, and analytical methods employed for the sample s. If the recovery of the matrix spike does not fall within control limits due to matrix interference's, the LCS recovery is to be used to validate the batch.

DUP: A sample duplicate was analyzed where applicable, and all results were acceptable. The duplicate result is used to determine the precision of the analysis by calculating the relative percent difference.

Sample	Sample result	Spike level	Matrix Spike Result	Matrix Recovery (%)
3/2-09S03E34L009 - 1	8.612	1.00	8.92389	117%
3/2-09S03E36J002 - 11	11.767	1.00	11.6867	110%

LCS Sample #	True Value	Actual Value	LCS Recovery (%)
1	1.00	1.028	103%
2	25.00	25.359	101%
3			

Sample	1st Result	Duplicate	RPD(%)
3/2-09S03E34L009 - 1	8.60975	8.615	-0.1%
3/2-09S03E36J002 - 11	11.7911	11.744	0.4%

QUALITY CONTROL DATA REPORT
For
Nitrate Testing Program

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There were no problems encountered with sample receipt.

Analytical Information/problems:
There were no problems encountered with the sample analysis.

Quality Control:
The quality control data is summarized below:

MS: A matrix spike was analyzed where applicable, and all results were acceptable. The matrix spike is an aliquot of sample fortified with known quantities of specific compounds and are subjected to the entire analytical procedure.

LCS: A laboratory control sample was analyzed where applicable, and all results were acceptable. The LCS is a control sample of known, interference-free matrix that is analyzed using the same reagents, preparation, and analytical methods employed for the sample s. If the recovery of the matrix spike does not fall within control limits due to matrix interference's, the LCS recovery is to be used to validate the batch.

DUP: A sample duplicate was analyzed where applicable, and all results were acceptable. The duplicate result is used to determine the precision of the analysis by calculating the relative percent difference.

Sample	Sample result	Spike level	Matrix Spike Result	Matrix Recovery (%)
3/9-09S03E36Q004 - 1	16.620	1.00	16.075	112%
3/9-10S03E01F006 -11	9.763	1.00	9.800	101%
3/10-10S03E02N009 - 21	10.126	1.00	10.314	120%
3/10-10S04E08L001 - 31	2.336	1.00	3.101	100%
3/10-10S03E02G005 - 41	5.895	1.00	6.504	120%

LCS Sample #	True Value	Actual Value	LCS Recovery (%)
1	0.50	0.455	91%
2	1.00	1.041	104%
3	25.00	25.501	102%

Sample	1st Result	Duplicate	RPD(%)
3/9-09S03E36Q004 - 1	16.615	16.626	-0.1%
3/9-10S03E01F006 -11	9.666	9.861	-2.0%
3/10-10S03E02N009 - 21	10.106	10.145	-0.4%
3/10-10S04E08L001 - 31	2.339	2.333	0.3%
3/10-10S03E02G005 - 41	5.904	5.887	0.3%

QUALITY CONTROL DATA REPORT
For
Nitrate Testing Program

Sample Information/Problems:
There were no problems encountered with sample receipt.

Analytical Information/problems:
There were no problems encountered with the sample analysis.

Quality Control:
The quality control data is summarized below:

MS: A matrix spike was analyzed where applicable, and all results were acceptable. The matrix spike is an aliquot of sample fortified with known quantities of specific compounds and are subjected to the entire analytical procedure.

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DUP: A sample duplicate was analyzed where applicable, and all results were acceptable. The duplicate result is used to determine the precision of the analysis by calculating the relative percent difference.

Sample	Sample result	Spike level	Matrix Spike Result	Matrix Recovery (%)
3/16-10S03E02A007 - 1	15.223	1.00	14.806	111%
3/16-10S04E07D009 - 11	30.779	1.00	28.723	102%
3/16-09S03E35N007 - 21	3.829	1.00	4.513	107%
3/16-10S03E02N015 - 31	12.035	1.00	11.811	98%
3/17-10S03E13P004 - 41	6.546	1.00	6.901	101%

LCS Sample #	True Value	Actual Value	LCS Recovery (%)
1	1.00	1.026	103%
2	1.00	1.041	104%
3	25.00	25.291	101%

Sample	1st Result	Duplicate	RPD(%)
3/16-10S03E02A007 - 1	15.215	15.232	-0.1%
3/16-10S04E07D009 - 11	30.765	30.793	-0.1%
3/16-09S03E35N007 - 21	3.818	3.840	-0.6%
3/16-10S03E02N015 - 31	12.008	12.035	-0.2%
3/17-10S03E13P004 - 41	6.541	6.546	-0.1%

ERA RECOVERY

ERA3421	**TARGET VALUE**	**ACCEPTABLE RANGE**	**RESULTS**	**% Recovery**
NITRATE	**3.24**	2.92 -3.56	3.21	99%
WS-19	**TARGET VALUE**	**ACCEPTABLE RANGE**		**% Recovery**
NITRATE	**10.4**	NA	10.55	101%

QUALITY CONTROL DATA REPORT
For
Nitrate Testing Program

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Analytical Information/problems:
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Quality Control:
The quality control data is summarized below:

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DUP: A sample duplicate was analyzed where applicable, and all results were acceptable. The duplicate result is used to determine the precision of the analysis by calculating the relative percent difference.

Sample	Sample result	Spike level	Matrix Spike Result	Matrix Recovery (%)
3/23-10S04E06E011-1	17.391	1.00	16.649	100%
3/23-10S04E08F006 -11	8.163	1.00	8.382	104%
3/23-09S03E15L007 - 21	4.733	1.00	5.192	93%
3/24-10S04E07E009RO- 31	7.029	1.00	7.343	102%

LCS Sample #	True Value	Actual Value	LCS Recovery (%)
1	1.00	0.927	93%
2	1.00	1.000	100%
3	25.00	25.507	102%

Sample	1st Result	Duplicate	RPD(%)
3/23-10S04E06E011-1	17.422	17.361	0.4%
3/23-10S04E08F006 -11	8.192	8.134	0.7%
3/23-09S03E15L007 - 21	4.751	4.714	0.8%
3/24-10S04E07E009RO- 31	7.047	7.010	0.5%

ERA RECOVERY

ERA3421	**TARGET VALUE**	**ACCEPTABLE RANGE**	**RESULTS**	**% Recovery**
NITRATE	**3.24**	2.92 -3.56	3.16	98%
WS-19	**TARGET VALUE**	**ACCEPTABLE RANGE**		**% Recovery**
NITRATE	**10.4**	NA	10.61	102%

QUALITY CONTROL DATA REPORT
For
Nitrate Testing Program

Sample Information/Problems:
There were no problems encountered with sample receipt.

Analytical Information/problems:
There were no problems encountered with the sample analysis.

Quality Control:
The quality control data is summarized below:

MS: A matrix spike was analyzed where applicable, and all results were acceptable. The matrix spike is an aliquot of sample fortified with known quantities of specific compounds and are subjected to the entire analytical procedure.

LCS: A laboratory control sample was analyzed where applicable, and all results were acceptable. The LCS is a control sample of known, interference-free matrix that is analyzed using the same reagents, preparation, and analytical methods employed for the sample s. If the recovery of the matrix spike does not fall within control limits due to matrix interference's, the LCS recovery is to be used to validate the batch.

DUP: A sample duplicate was analyzed where applicable, and all results were acceptable. The duplicate result is used to determine the precision of the analysis by calculating the relative percent difference.

Sample	Sample result	Spike level	Matrix Spike Result	Matrix Recovery (%)
3/30-10S04E06M004 - 1	12.660	1.00	12.398	100%
3/30-10S03E12B003 - 11	11.951	1.00	11.768	101%
3/31-09S03E07H004 - 21	1.912	1.00	2.612	89%

LCS Sample #	True Value	Actual Value	LCS Recovery (%)
1	1.00	0.919	92%
2	1.00	0.932	93%
3	25.00	25.447	102%

Sample	1st Result	Duplicate	RPD(%)
3/30-10S04E06M004 - 1	12.669	12.652	0.1%
3/30-10S03E12B003 - 11	11.948	11.954	-0.1%
3/31-09S03E07H004 - 21	1.913	1.911	0.1%

ERA RECOVERY

ERA3421	**TARGET VALUE**	**ACCEPTABLE RANGE**	**RESULTS**	**% Recovery**
NITRATE	**3.24**	2.92 -3.56	3.23	100%
WS-19	**TARGET VALUE**	**ACCEPTABLE RANGE**		**% Recovery**
NITRATE	**10.4**	NA	10.67	103%

QUALITY CONTROL DATA REPORT
For
Nitrate Testing Program

Sample Information/Problems:
There were no problems encountered with sample receipt.

Analytical Information/problems:
There were no problems encountered with the sample analysis.

Quality Control:
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LCS: A laboratory control sample was analyzed where applicable, and all results were acceptable. The LCS is a control sample of known, interference-free matrix that is analyzed using the same reagents, preparation, and analytical methods employed for the sample s. If the recovery of the matrix spike does not fall within control limits due to matrix interference's, the LCS recovery is to be used to validate the batch.

DUP: A sample duplicate was analyzed where applicable, and all results were acceptable. The duplicate result is used to determine the precision of the analysis by calculating the relative percent difference.

Sample	Sample result	Spike level	Matrix Spike Result	Matrix Recovery (%)
4/6-10S04E27K007 - 1	4.901	1.00	5.40472	99%
4/6-10S04E07F019 - 11	16.314	1.00	15.6878	100%
4/7-10S04E18A011 - 21	15.017	1.00	14.5151	100%
4/7-10S04E17N011 - 31	13.471	1.00	13.1181	99%
4/7-09S03E36L004 - 41	18.112	1.00	17.2757	98%

LCS Sample #	True Value	Actual Value	LCS Recovery (%)
1	1.00	0.920869	92%
2	1.00	0.940201	94%
3	25.00	25.1090	100%

Sample	1st Result	Duplicate	RPD(%)
4/6-10S04E27K007 - 1	4.89993	4.90155	0.0%
4/6-10S04E07F019 - 11	16.3183	16.3106	0.0%
4/7-10S04E18A011 - 21	15.0213	15.0122	0.1%
4/7-10S04E17N011 - 31	13.4636	13.4791	-0.1%
4/7-09S03E36L004 - 41	18.1276	18.0954	0.2%

ERA RECOVERY

ERA3421	**TARGET VALUE**	**ACCEPTABLE RANGE**	**RESULTS**	**% Recovery**
NITRATE	**3.24**	2.92 -3.56	3.20	99%
WS-19	**TARGET VALUE**	**ACCEPTABLE RANGE**		**% Recovery**
NITRATE	**10.4**	NA	10.65	102%

QUALITY CONTROL DATA REPORT
For
Nitrate Testing Program

Sample Information/Problems:
There were no problems encountered with sample receipt.

Analytical Information/problems:
There were no problems encountered with the sample analysis.

Quality Control:
The quality control data is summarized below:

MS: A matrix spike was analyzed where applicable, and all results were acceptable. The matrix spike is an aliquot of sample fortified with known quantities of specific compounds and are subjected to the entire analytical procedure.

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DUP: A sample duplicate was analyzed where applicable, and all results were acceptable. The duplicate result is used to determine the precision of the analysis by calculating the relative percent difference.

Sample	Sample result	Spike level	Matrix Spike Result	Matrix Recovery (%)
4/14-10S03E13M001 - 1	13.874	1.00	13.4853	100%
4/14-10S04E08D002 - 11	2.438	1.00	3.0772	88%
4/13-10S04E18H005 - 21	10.750	1.00	10.6655	99%
4/14-10S04E20J005 -31	1.942	1.00	2.5545	81%
4/14-10S04E27K008 - 41	9.232	1.00	9.3150	101%

LCS Sample #	True Value	Actual Value	LCS Recovery (%)
1	1.00	0.9170	92%
2	10.00	9.3600	94%
3	0.50	0.4900	98%

Sample	1st Result	Duplicate	RPD(%)
4/14-10S03E13M001 - 1	13.8636	13.8843	-0.1%
4/14-10S04E08D002 - 11	2.4910	2.3850	4.3%
4/13-10S04E18H005 - 21	10.7278	10.7727	-0.4%
4/14-10S04E20J005 -31	1.9200	1.9640	-2.3%
4/14-10S04E27K008 - 41	9.1437	9.3201	-1.9%

ERA RECOVERY

ERA3421	**TARGET VALUE**	**ACCEPTABLE RANGE**	**RESULTS**	**% Recovery**
NITRATE	**3.24**	2.92 -3.56	3.06	94%
WS-19	**TARGET VALUE**	**ACCEPTABLE RANGE**		**% Recovery**
NITRATE	**10.4**	NA	10.55	101%

QUALITY CONTROL DATA REPORT
For
Nitrate Testing Program

Sample Information/Problems:
There were no problems encountered with sample receipt.

Analytical Information/problems:
There were no problems encountered with the sample analysis.

Quality Control:
The quality control data is summarized below:

MS: A matrix spike was analyzed where applicable, and all results were acceptable. The matrix spike is an aliquot of sample fortified with known quantities of specific compounds and are subjected to the entire analytical procedure.

LCS: A laboratory control sample was analyzed where applicable, and all results were acceptable. The LCS is a control sample of known, interference-free matrix that is analyzed using the same reagents, preparation, and analytical methods employed for the sample s. If the recovery of the matrix spike does not fall within control limits due to matrix interference's, the LCS recovery is to be used to validate the batch.

DUP: A sample duplicate was analyzed where applicable, and all results were acceptable. The duplicate result is used to determine the precision of the analysis by calculating the relative percent difference.

Sample	Sample result	Spike level	Matrix Spike Result	Matrix Recovery (%)
4/20-10S04E28D010 - 1	6.834	1.00	7.165	101%
4/20-10S03E12C014 - 11	12.937	1.00	12.643	100%
4/21-10S04E34L007 - 21	38.430	1.00	35.731	114%

LCS Sample #	True Value	Actual Value	LCS Recovery (%)
1	0.500	0.501	100%
2	10.000	10.007	100%
3	25.000	25.501	102%

Sample	1st Result	Duplicate	RPD(%)
4/20-10S04E28D010 - 1	6.828	6.840	-0.2%
4/20-10S03E12C014 - 11	12.934	12.939	0.0%
4/21-10S04E34L007 - 21	38.366	38.495	-0.3%

ERA RECOVERY

ERA3421	**TARGET VALUE**	**ACCEPTABLE RANGE**	**RESULTS**	**% Recovery**
NITRATE	**3.24**	2.92 -3.56	3.21	99%
WS-19	**TARGET VALUE**	**ACCEPTABLE RANGE**		**% Recovery**
NITRATE	**10.4**	NA	10.54	101%

QUALITY CONTROL DATA REPORT
For
Nitrate Testing Program

Sample Information/Problems:
There were no problems encountered with sample receipt.

Analytical Information/problems:
There were no problems encountered with the sample analysis.

Quality Control:
The quality control data is summarized below:

MS: A matrix spike was analyzed where applicable, and all results were acceptable. The matrix spike is an aliquot of sample fortified with known quantities of specific compounds and are subjected to the entire analytical procedure.

LCS: A laboratory control sample was analyzed where applicable, and all results were acceptable. The LCS is a control sample of known, interference-free matrix that is analyzed using the same reagents, preparation, and analytical methods employed for the sample s. If the recovery of the matrix spike does not fall within control limits due to matrix interference's, the LCS recovery is to be used to validate the batch.

DUP: A sample duplicate was analyzed where applicable, and all results were acceptable. The duplicate result is used to determine the precision of the analysis by calculating the relative percent difference.

Sample	Sample result	Spike level	Matrix Spike Result	Matrix Recovery (%)
4/27-10S04E21P004 - 1	7.578	1.00	7.869	105%
4/27-10S04E04C009 - 11	14.896	1.00	14.442	104%
4/28-10S04E17P004 - 21	10.864	1.00	10.793	102%
4/27-10S04E34A001 - 31	10.987	1.00	10.852	96%

LCS Sample #	True Value	Actual Value	LCS Recovery (%)
1	1.00	1.0674	107%
2	10.00	10.183	102%
3	25.00	25.501	102%

Sample	1st Result	Duplicate	RPD(%)
4/27-10S04E21P004 - 1	7.570	7.585	-0.2%
4/27-10S04E04C009 - 11	14.921	14.871	0.3%
4/28-10S04E17P004 - 21	10.830	10.898	-0.6%
4/27-10S04E34A001 - 31	11.025	10.948	0.7%

ERA RECOVERY

ERA3421	**TARGET VALUE**	**ACCEPTABLE RANGE**	**RESULTS**	**% Recovery**
NITRATE	**3.24**	2.92 -3.56	3.16	97%
WS-19	**TARGET VALUE**	**ACCEPTABLE RANGE**		**% Recovery**
NITRATE	**10.4**	NA	10.67	103%

QUALITY CONTROL DATA REPORT
For
Nitrate Testing Program

Sample Information/Problems:
There were no problems encountered with sample receipt.

Analytical Information/problems:
There were no problems encountered with the sample analysis.

Quality Control:
The quality control data is summarized below:

MS: A matrix spike was analyzed where applicable, and all results were acceptable. The matrix spike is an aliquot of sample fortified with known quantities of specific compounds and are subjected to the entire analytical procedure.

LCS: A laboratory control sample was analyzed where applicable, and all results were acceptable. The LCS is a control sample of known, interference-free matrix that is analyzed using the same reagents, preparation, and analytical methods employed for the sample s. If the recovery of the matrix spike does not fall within control limits due to matrix interference's, the LCS recovery is to be used to validate the batch.

DUP: A sample duplicate was analyzed where applicable, and all results were acceptable. The duplicate result is used to determine the precision of the analysis by calculating the relative percent difference.

Sample	Sample result	Spike level	Matrix Spike Result	Matrix Recovery (%)
5/4-10S04E19C006 - 1	8.908	1.00	9.133	112%
5/4-10S03E01K005 RO - 11	0.787	1.00	1.684	98%
5/5-10S04E28R001 - 21	15.628	1.00	15.135	107%

LCS Sample #	True Value	Actual Value	LCS Recovery (%)
1	1.00	1.106	111%
2	10.00	10.015	100%
3	25.00	25.207	101%

Sample	1st Result	Duplicate	RPD(%)
5/4-10S04E19C006 - 1	8.892	8.924	-0.4%
5/4-10S03E01K005 RO - 11	0.790	0.784	0.8%
5/5-10S04E28R001 - 21	15.631	15.626	0.0%

ERA RECOVERY

ERA3421	TARGET VALUE	ACCEPTABLE RANGE	RESULTS	**% Recovery**
NITRATE	**3.24**	2.92 -3.56	3.58	110%
WS-19	TARGET VALUE	ACCEPTABLE RANGE		**% Recovery**
NITRATE	**10.4**	NA	11.14	107%

QUALITY CONTROL DATA REPORT
For
Nitrate Testing Program

Sample Information/Problems:
There were no problems encountered with sample receipt.

Analytical Information/problems:
There were no problems encountered with the sample analysis.

Quality Control:
The quality control data is summarized below:

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DUP: A sample duplicate was analyzed where applicable, and all results were acceptable. The duplicate result is used to determine the precision of the analysis by calculating the relative percent difference.

Sample	Sample result	Spike level	Matrix Spike Result	Matrix Recovery (%)
5/11-09S03E35D005 - 1	3.733	1.00	4.3585	100%
5/12-09S02E12A006 - 11	8.529	1.00	8.9580	128%

LCS Sample #	True Value	Actual Value	LCS Recovery (%)
1	1.00	1.0117	101%
2	25.00	26.1942	105%

Sample	1st Result	Duplicate	RPD(%)
5/11-09S03E35D005 - 1	3.7304	3.7354	-0.1%
5/12-09S02E12A006 - 11	8.5670	8.4900	0.9%

ERA RECOVERY

ERA3421	TARGET VALUE	ACCEPTABLE RANGE	RESULTS	% Recovery
NITRATE	**3.24**	2.92 -3.56	3.23	100%

QUALITY CONTROL DATA REPORT
For
Nitrate Testing Program

Sample Information/Problems:
There were no problems encountered with sample receipt.

Analytical Information/problems:
There were no problems encountered with the sample analysis.

Quality Control:
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DUP: A sample duplicate was analyzed where applicable, and all results were acceptable. The duplicate result is used to determine the precision of the analysis by calculating the relative percent difference.

Sample	Sample result	Spike level	Matrix Spike Result	Matrix Recovery (%)
09S03E18G015 RO	0.000	1.00	1.0320	103%
09S03E17C003	10.8300	1.00	10.8250	108%

LCS Sample #	True Value	Actual Value	LCS Recovery (%)
1	0.50	0.5020	100%
2	0.50	0.5040	101%

Sample	1st Result	Duplicate	RPD(%)
09S03E18G015 RO DUP.	0.0000	0.0000	0.0%
09S03E17C003 DUP.	10.8300	10.8180	0.1%

ERA RECOVERY

ERA3421	TARGET VALUE	ACCEPTABLE RANGE	RESULTS	% Recovery
NITRATE	**3.24**	2.92 -3.56	3.20	99%

QUALITY CONTROL DATA REPORT
For
Nitrate Testing Program

Sample Information/Problems:
There were no problems encountered with sample receipt.

Analytical Information/problems:
There were no problems encountered with the sample analysis.

Quality Control:
The quality control data is summarized below:

MS: A matrix spike was analyzed where applicable, and all results were acceptable. The matrix spike is an aliquot of sample fortified with known quantities of specific compounds and are subjected to the entire analytical procedure.

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DUP: A sample duplicate was analyzed where applicable, and all results were acceptable. The duplicate result is used to determine the precision of the analysis by calculating the relative percent difference.

Sample	Sample result	Spike level	Matrix Spike Result	Matrix Recovery (%)
5/26-09S02E12R014- 1	0.000	1.00	0.9793	98%

LCS Sample #	True Value	Actual Value	LCS Recovery (%)
1	1.00	1.0285	103%
2	25.00	24.9540	100%

Sample	1st Result	Duplicate	RPD(%)
5/26-09S02E12R014- 1	0.000	0.000	0.0%

ERA RECOVERY

ERA3421	TARGET VALUE	ACCEPTABLE RANGE	RESULTS	% Recovery
NITRATE	**3.24**	2.92 -3.56	3.14	97%

QUALITY CONTROL DATA REPORT
For
Nitrate Testing Program

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Analytical Information/problems:
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DUP: A sample duplicate was analyzed where applicable, and all results were acceptable. The duplicate result is used to determine the precision of the analysis by calculating the relative percent difference.

Sample	Sample result	Spike level	Matrix Spike Result	Matrix Recovery (%)
6/1-09S02E02R010 - 1	15.400	1.00	14.959	110%
6/1-3415 RANCHO VISTA CT - 1	3.340	1.00	4.039	103%
6/2-11S04E18J002 - 21	3.441	1.00	4.127	103%

LCS Sample #	True Value	Actual Value	LCS Recovery (%)
1	1.00	1.010	101%
2	10.00	10.191	102%
3	25.00	25.501	102%

Sample	1st Result	Duplicate	RPD(%)
6/1-09S02E02R010 - 1	15.392	15.407	-0.1%
6/1-3415 RANCHO VISTA CT - 1	3.339	3.342	-0.1%
6/2-11S04E18J002 - 21	3.442	3.440	0.0%

ERA RECOVERY

ERA3421	TARGET VALUE	CCEPTABLE RANG	RESULTS	% Recovery
NITRATE	**3.24**	2.92 -3.56	3.02	93%

QUALITY CONTROL DATA REPORT
For
Nitrate Testing Program

Sample Information/Problems:
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Analytical Information/problems:
There were no problems encountered with the sample analysis.

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DUP: A sample duplicate was analyzed where applicable, and all results were acceptable. The duplicate result is used to determine the precision of the analysis by calculating the relative percent difference.

Sample	Sample result	Spike level	Matrix Spike Result	Matrix Recovery (%)
6/15-09S02E01N010 - 1	15.288	1.00	14.817	106%
6/16-8465 PHARMER RD - 11	2.011	1.00	2.762	95%

LCS Sample #	True Value	Actual Value	LCS Recovery (%)
1	0.50	0.500	100%
2	1.00	0.999	100%

Sample	1st Result	Duplicate	RPD(%)
6/15-09S02E01N010 - 1	15.262	15.315	-0.3%
6/16-8465 PHARMER RD - 11	2.018	2.004	0.7%

ERA RECOVERY

ERA3421	TARGET VALUE	ACCEPTABLE RANGE	RESULTS	% Recovery
NITRATE	**3.24**	2.92 -3.56	3.01	93%

QUALITY CONTROL DATA REPORT
For
Nitrate Testing Program

Sample Information/Problems:
There were no problems encountered with sample receipt.

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There were no problems encountered with the sample analysis.

Quality Control:
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DUP: A sample duplicate was analyzed where applicable, and all results were acceptable. The duplicate result is used to determine the precision of the analysis by calculating the relative percent difference.

Sample	Sample result	Spike level	Matrix Spike Result	Matrix Recovery (%)
7/8-09S03E25D004 - 1 DUP	10.693	4.00	12.422	97%

LCS Sample #	True Value	Actual Value	LCS Recovery (%)
1	2.00	1.874	94%
2	10.00	9.715	97%

Sample	1st Result	Duplicate	RPD(%)
7/8-09S03E25D004 - 1 DUP	10.687	10.698	-0.1%

ERA RECOVERY

ERA3421	TARGET VALUE	ACCEPTABLE RANGE	RESULTS	% Recovery
NITRATE	**3.24**	2.92 -3.56	3.05	94%

QUALITY CONTROL DATA REPORT
For
Nitrate Testing Program

Sample Information/Problems:
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Analytical Information/problems:
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Quality Control:
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DUP: A sample duplicate was analyzed where applicable, and all results were acceptable. The duplicate result is used to determine the precision of the analysis by calculating the relative percent difference.

Sample	Sample result	Spike level	Matrix Spike Result	Matrix Recovery (%)
7/14-10S04E07M018 - 1	9.757	1.00	9.825	104%
7/14-10S03E25B008 - 11	16.579	1.00	15.826	91%

LCS Sample #	True Value	Actual Value	LCS Recovery (%)
1	2.00	1.920	96%
2	10.00	10.135	101%

Sample	1st Result	Duplicate	RPD(%)
7/14-10S04E07M018 - 1	9.753	9.762	-0.1%
7/14-10S03E25B008 - 11	16.539	16.618	-0.5%

ERA RECOVERY

ERA3421	TARGET VALUE	ACCEPTABLE RANGE	RESULTS	% Recovery
NITRATE	**3.24**	2.92 -3.56	2.95	91%

QUALITY CONTROL DATA REPORT
For
Nitrate Testing Program

Sample Information/Problems:
There were no problems encountered with sample receipt.

Analytical Information/problems:
There were no problems encountered with the sample analysis.

Quality Control:
The quality control data is summarized below:

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DUP: A sample duplicate was analyzed where applicable, and all results were acceptable. The duplicate result is used to determine the precision of the analysis by calculating the relative percent difference.

Sample	Sample result	Spike level	Matrix Spike Result	Matrix Recovery (%)
8/24-09S02E01M003- 1	4.969	1.00	5.422	95%
8/24-10S03E25B005 - 11	10.471	1.00	10.360	94%

LCS Sample #	True Value	Actual Value	LCS Recovery (%)
1	1.000	0.918	92%
2	1.000	0.947	95%
3	20.00	19.419	97%

Sample	1st Result	Duplicate	RPD(%)
8/24-09S02E01M003- 1	4.974	4.964	0.2%
8/24-10S03E25B005 - 11	10.462	10.479	-0.2%

ERA RECOVERY

ERA3421	TARGET VALUE	ACCEPTABLE RANGE	RESULTS	% Recovery
NITRATE	**3.24**	2.92 -3.56	3.08	95%

APPENDIX D
Santa Clara County Health Department
Santa Clara County Private Well Sampling Program—1988 Data

Santa Clara County Health Department
Santa Clara County Private Well Sampling Program - 1988

State Well Number	Old Well Number	Nitrate Conc. mg/L	State Well Number	Old Well Number	Nitrate Conc. (mg/L)	State Well Number	Old Well Number	Nitrate Conc. mg/L
08S02E26M003	08S2E26M03	3.5	08S02E26N003	08S2E26N03	3.2	08S02E26P002	08S2E26P02	4.7
08S02E26Q009	08S2E26Q09	4.4	08S02E35E002	08S2E35E02	5.1	08S02E35G002	08S2E35G02	10.0
08S02E36N013	08S2E36N13	3.2	09S02E01C007	09S2E01C07	2.7	09S02E01C009	09S2E01C09	1.4
09S02E01K003	09S2E01K03	3.7	09S02E01L004	09S2E01L04	5.2	09S02E01L005	09S2E01L05	11.0
09S02E01L007	09S2E01L07	13.0	09S02E01M003	09S2E01M03	15.0	09S02E01N004	09S2E01N04	96.0
09S02E01N010	09S2E01N10	78.0	09S02E01P007	09S2E01P07	22.0	09S02E01Q007	09S2E01Q07	4.0
09S02E01Q010	09S2E01Q10	7.2	09S02E01Q011	09S2E01Q11	14.0	09S02E01R003	09S2E01R03	3.3
09S02E02J006	09S2E02J06	9.0	09S02E02J008	09S2E02J08	3.3	09S02E02N001	09S2E02N01	26.0
09S02E02P003	09S2E02P03	68.0	09S02E02Q011	09S2E02Q11	60.0	09S02E02Q013	09S2E02Q13	45.0
09S02E02R008	09S2E02R08	70.0	09S02E11A001	09S2E11A01	44.0	09S02E11G001	09S2E11G01	28.0
09S02E11G006	09S2E11G06	30.0	09S02E11H003	09S2E11H03	5.5	09S02E11H011	09S2E11H11	31.0
09S02E12B006	09S2E12B06	31.0	09S02E12D007	09S2E12D07	43.0	09S02E12G004	09S2E12G04	31.0
09S02E12H002	09S2E12H02	40.0	09S02E12H005	09S2E12H05	23.0	09S02E12K002	09S2E12K02	80.0
09S02E12R005	09S2E12R05	43.0	09S02E12R006	09S2E12R06	50.0	09S02E12R010	09S2E12R10	47.0
09S02E13A002	09S2E13A02	37.0	09S02E13A004	09S2E13A04	22.0	09S02E13A006	09S2E13A06	19.0
09S03E07E001	09S3E07E01	26.0	09S03E07E006	09S3E07E06	37.0	09S03E07H005	09S3E07H05	8.5
09S03E07H006	09S3E07H06	5.4	09S03E07L006	09S3E07L06	61.0	09S03E07N005	09S3E07N05	40.0
09S03E07P001	09S3E07P01	38.0	09S03E07P003	09S3E07P03	80.0	09S03E07P011	09S3E07P11	49.0
09S03E08J002	09S3E08J02	6.5	09S03E08J006	09S3E08J06	2.3	09S03E08J007	09S3E08J07	23.0
09S03E08J009	09S3E08J09	2.2	09S03E08J010	09S3E08J10	4.0	09S03E08J013	09S3E08J13	3.2
09S03E08K005	09S3E08K05	2.8	09S03E08P004	09S3E08P04	7.5	09S03E08P005	09S3E08P05	19.0
09S03E08Q001	09S3E08Q01	18.0	09S03E08Q006	09S3E08Q06	13.0	09S03E09M001	09S3E09M01	13.0
09S03E09N002	09S3E09N02	23.0	09S03E09Q006	09S3E09Q06	10.0	09S03E14N001	09S3E14N01	30.0
09S03E14N005	09S3E14N05	46.0	09S03E14P001	09S3E14P01	23.0	09S03E15C002	09S3E15C02	1.1
09S03E15E004	09S3E15E04	12.0	09S03E15J002	09S3E15J02	9.9	09S03E15J004	09S3E15J04	29.0

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State Well Number	Old Well Number	Nitrate Conc. mg/L	State Well Number	Old Well Number	Nitrate Conc. (mg/L)	State Well Number	Old Well Number	Nitrate Conc. mg/L
09S03E15J009	09S3E15J09	33.0	09S03E15K007	09S3E15K07	26.0	09S03E15L005	09S3E15L05	10.0
09S03E15L011	09S3E15L11	12.0	09S03E15N003	09S3E15N03	13.0	09S03E15R015	09S3E15R15	9.6
09S03E16B002	09S3E16B02	180.0	09S03E16Q002	09S3E16Q02	1.8	09S03E16Q006	09S3E16Q06	4.9
09S03E17B007	09S3E17B07	23.0	09S03E17C003	09S3E17C03	37.0	09S03E17F005	09S3E17F05	56.0
09S03E17F006	09S3E17F06	90.0	09S03E17L005	09S3E17L05	50.0	09S03E17P005	09S3E17P05	6.2
09S03E18B004	09S3E18B04	32.0	09S03E18B006	09S3E18B06	32.0	09S03E18B011	09S3E18B11	37.0
09S03E18C005	09S3E18C05	27.0	09S03E18D003	09S3E18D03	5.2	09S03E18D008	09S3E18D08	49.0
09S03E18F004	09S3E18F04	17.0	09S03E18G006	09S3E18G06	36.0	09S03E18G012	09S3E18G12	19.0
09S03E18G013	09S3E18G13	44.0	09S03E19J005	09S3E19J05	20.0	09S03E19J007	09S3E19J07	34.0
09S03E19R002	09S3E19R02	7.8	09S03E21B001	09S3E21B01	9.3	09S03E21B003	09S3E21B03	7.5
09S03E22E001	09S3E22E01	2.1	09S03E22J001	09S3E22J01	38.0	09S03E22Q002	09S3E22Q02	9.8
09S03E22R004	09S3E22R04	12.0	09S03E22R007	09S3E22R07	8.3	09S03E23C006	09S3E23C06	22.0
09S03E23D005	09S3E23D05	30.0	09S03E23D007	09S3E23D07	51.0	09S03E23D008	09S3E23D08	24.0
09S03E23N004	09S3E23N04	87.0	09S03E25D004	09S3E25D04	33.0	09S03E25D008	09S3E25D08	88.0
09S03E25E002	09S3E25E02	28.0	09S03E25E005	09S3E25E05	45.0	09S03E25J002	09S3E25J02	7.8
09S03E26A003	09S3E26A03	38.0	09S03E26B004	09S3E26B04	72.0	09S03E26D004	09S3E26D04	74.0
09S03E26F002	09S3E26F02	34.0	09S03E26L005	09S3E26L05	46.0	09S03E26L010	09S3E26L10	72.0
09S03E26M003	09S3E26M03	49.0	09S03E26M004	09S3E26M04	46.0	09S03E26P004	09S3E26P04	86.0
09S03E26Q002	09S3E26Q02	46.0	09S03E26R001	09S3E26R01	150.0	09S03E26R004	09S3E26R04	79.0
09S03E27A001	09S3E27A01	10.0	09S03E27C010	09S3E27C10	8.6	09S03E27F001	09S3E27F01	8.6
09S03E27F003	09S3E27F03	6.4	09S03E27F006	09S3E27F06	9.4	09S03E29R004	09S3E29R04	47.0
09S03E29R005	09S3E29R05	38.0	09S03E29R006	09S3E29R06	30.0	09S03E30P003	09S3E30P03	6.6
09S03E30P004	09S3E30P04	3.9	09S03E30P007	09S3E30P07	11.0	09S03E31C002	09S3E31C02	12.0
09S03E31C006	09S3E31C06	10.0	09S03E31C008	09S3E31C08	3.6	09S03E31C009	09S3E31C09	12.0
09S03E31C009	09S3E31C09	12.0	09S03E31F004	09S3E31F04	2.9	09S03E31G005	09S3E31G05	1.9

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State Well Number	Old Well Number	Nitrate Conc. mg/L	State Well Number	Old Well Number	Nitrate Conc. (mg/L)	State Well Number	Old Well Number	Nitrate Conc. mg/L
09S03E31G008	09S3E31G08	3.6	09S03E31G011	09S3E31G11	2.7	09S03E31K002	09S3E31K02	7.8
)9S03E31K007	09S3E31K07	8.8	09S03E31K008	09S3E31K08	5.1	09S03E31K012	09S3E31K12	7.1
09S03E31R005	09S3E31R05	5.0	09S03E31R007	09S3E31R07	5.3	09S03E31R012	09S3E31R12	28.0
)9S03E31R015	09S3E31R15	1.8	09S03E32J001	09S3E32J01	21.0	09S03E32J011	09S3E32J11	39.0
09S03E32J015	09S3E32J15	22.0	09S03E32N001	09S3E32N01	3.0	09S03E32N012	09S3E32N12	2.1
)9S03E32Q010	09S3E32Q10	36.0	09S03E32R006	09S3E32R06	1.7	09S03E32R010	09S3E32R10	26.0
09S03E33F003	09S3E33F03	87.0	09S03E33M004	09S3E33M04	52.0	09S03E33M010	09S3E33M10	23.0
)9S03E33N001	09S3E33N01	34.0	09S03E33N005	09S3E33N05	37.0	09S03E34H003	09S3E34H03	60.0
09S03E34H008	09S3E34H08	38.0	09S03E34H009	09S3E34H09	39.0	09S03E34J003	09S3E34J03	68.0
)9S03E34N005	09S3E34N05	56.0	09S03E34N006	09S3E34N06	66.0	09S03E34P001	09S3E34P01	98.0
09S03E34Q005	09S3E34Q05	14.0	09S03E34R007	09S3E34R07	63.0	09S03E35A006	09S3E35A06	70.0
)9S03E35A016	09S3E35A16	100.0	09S03E35B005	09S3E35B05	90.0	09S03E35C005	09S3E35C05	31.0
09S03E35C007	09S3E35C07	44.0	09S03E35D008	09S3E35D08	23.0	09S03E35E011	09S3E35E11	18.0
)9S03E35F005	09S3E35F05	16.0	09S03E35F006	09S3E35F06	33.0	09S03E35H009	09S3E35H09	88.0
09S03E35J007	09S3E35J07	40.0	09S03E35J008	09S3E35J08	96.0	09S03E35K001	09S3E35K01	42.0
)9S03E35L007	09S3E35L07	20.0	09S03E35P001	09S3E35P01	41.0	09S03E35R003	09S3E35R03	84.0
09S03E35R011	09S3E35R11	79.0	09S03E35R011	09S3E35R11	79.0	09S03E36A002	09S3E36A02	25.0
)9S03E36B004	09S3E36B04	34.0	09S03E36B006	09S3E36B06	26.0	09S03E36B007	09S3E36B07	27.0
09S03E36C003	09S3E36C03	1.1	09S03E36C004	09S3E36C04	28.0	09S03E36E007	09S3E36E07	49.0
)9S03E36E008	09S3E36E08	88.0	09S03E36F015	09S3E36F15	46.0	09S03E36J003	09S3E36J03	18.0
09S03E36L012	09S3E36L12	50.0	09S03E36M001	09S3E36M01	98.0	09S03E36M007	09S3E36M07	56.0
9S03E36N009	09S3E36N09	10.0	09S03E36P002	09S3E36P02	50.0	09S03E36Q002	09S3E36Q02	69.0
10S03E01A002	10S3E01A02	34.0	10S03E01A004	10S3E01A04	45.0	10S03E01A007	10S3E01A07	44.0
0S03E01A009	10S3E01A09	63.0	10S03E01C014	10S3E01C14	55.0	10S03E01E002	10S3E01E02	38.0
10S03E01E007	10S3E01E07	45.0	10S03E01F007	10S3E01F07	44.0	10S03E01F011	10S3E01F11	60.0

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10S03E01F013	10S3E01F13	72.0	10S03E01G002	10S3E01G02	44.0	10S03E01G003	10S3E01G03	68.0
10S03E01H005	10S3E01H05	64.0	10S03E01J004	10S3E01J04	71.0	10S03E01J006	10S3E01J06	82.0
10S03E01P003	10S3E01P03	38.0	10S03E01Q001	10S3E01Q01	52.0	10S03E01R004	10S3E01R04	66.0
10S03E02C004	10S3E02C04	24.0	10S03E02G001	10S3E02G01	38.0	10S03E02K001	10S3E02K01	37.0
10S03E02M005	10S3E02M05	24.0	10S03E02N003	10S3E02N03	18.0	10S03E02N010	10S3E02N10	33.0
10S03E02N017	10S3E02N17	33.0	10S03E03A002	10S3E03A02	26.0	10S03E03A011	10S3E03A11	47.0
10S03E03B004	10S3E03B04	45.0	10S03E03C007	10S3E03C07	38.0	10S03E03D009	10S3E03D09	36.0
10S03E03E006	10S3E03E06	15.0	10S03E03F006	10S3E03F06	18.0	10S03E03F008	10S3E03F08	15.0
10S03E03J008	10S3E03J08	33.0	10S03E03J010	10S3E03J10	51.0	10S03E03L002	10S3E03L02	12.0
10S03E03Q002	10S3E03Q02	42.0	10S03E03Q009	10S3E03Q09	7.4	10S03E03R002	10S3E03R02	51.0
10S03E03R008	10S3E03R08	49.0	10S03E03R010	10S3E03R10	75.0	10S03E03R012	10S3E03R12	68.0
10S03E04F004	10S3E04F04	36.0	10S03E04F007	10S3E04F07	3.9	10S03E04F011	10S3E04F11	9.7
10S03E04G006	10S3E04G06	20.0	10S03E04G007	10S3E04G07	14.0	10S03E04P002	10S3E04P02	9.3
10S03E04P003	10S3E04P03	62.0	10S03E04P004	10S3E04P04	17.0	10S03E04P009	10S3E04P09	48.0
10S03E05C007	10S3E05C07	44.0	10S03E05C009	10S3E05C09	74.0	10S03E05D008	10S3E05D08	1.6
10S03E05F003	10S3E05F03	3.0	10S03E05J004	10S3E05J04	1.7	10S03E05J009	10S3E05J09	8.6
10S03E05J023	10S3E05J23	15.0	10S03E05K003	10S3E05K03	8.7	10S03E05K012	10S3E05K12	8.1
10S03E05R003	10S3E05R03	8.6	10S03E06A002	10S3E06A02	3.6	10S03E08R001	10S3E08R01	41.0
10S03E08R011	10S3E08R11	14.0	10S03E09D001	10S3E09D01	3.2	10S03E09D003	10S3E09D03	3.3
10S03E09E006	10S3E09E06	8.8	10S03E09M004	10S3E09M04	38.0	10S03E10A013	10S3E10A13	31.0
10S03E10B008	10S3E10B08	140.0	10S03E11A001	10S3E11A01	6.1	10S03E11D005	10S3E11D05	60.0
10S03E11D006	10S3E11D06	51.0	10S03E11E002	10S3E11E02	47.0	10S03E11H007	10S3E11H07	7.0
10S03E11N001	10S3E11N01	47.0	10S03E11N002	10S3E11N02	33.0	10S03E11Q002	10S3E11Q02	41.0
10S03E11Q004	10S3E11Q04	48.0	10S03E11Q005	10S3E11Q05	48.0	10S03E12A005	10S3E12A05	47.0
10S03E12A009	10S3E12A09	57.0	10S03E12B001	10S3E12B01	53.0	10S03E12B004	10S3E12B04	74.0

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10S03E12B006	10S3E12B06	85.0	10S03E12C004	10S3E12C04	48.0	10S03E12C006	10S3E12C06	47.0
10S03E12C008	10S3E12C08	36.0	10S03E12G002	10S3E12G02	44.0	10S03E12G004	10S3E12G04	37.0
10S03E12H001	10S3E12H01	62.0	10S03E12H008	10S3E12H08	46.0	10S03E12J003	10S3E12J03	41.0
10S03E12J005	10S3E12J05	42.0	10S03E12J006	10S3E12J06	46.0	10S03E12K005	10S3E12K05	42.0
10S03E12N010	10S3E12N10	15.0	10S03E13K006	10S3E13K06	3.9	10S03E13P004	10S3E13P04	26.0
10S03E14C004	10S3E14C04	35.0	10S03E14L001	10S3E14L01	60.0	10S03E14P002	10S3E14P02	12.0
10S03E14R006	10S3E14R06	45.0	10S03E17G004	10S3E17G04	87.0	10S03E17G006	10S3E17G06	32.0
10S03E17J001	10S3E17J01	23.0	10S03E17K003	10S3E17K03	28.0	10S03E17L002	10S3E17L02	31.0
10S03E18L001	10S3E18L01	3.6	10S03E20B001	10S3E20B01	41.0	10S03E20B004	10S3E20B04	5.8
10S03E20H001	10S3E20H01	2.0	10S03E21J001	10S3E21J01	10.0	10S03E21K002	10S3E21K02	28.0
10S03E22N002	10S3E22N02	77.0	10S03E22N005	10S3E22N05	94.0	10S03E23G005	10S3E23G05	36.0
10S03E23R001	10S3E23R01	24.0	10S03E24A009	10S3E24A09	5.6	10S03E24B005	10S3E24B05	22.0
10S03E24G008	10S3E24G08	88.0	10S03E24N002	10S3E24N02	82.0	10S03E24P002	10S3E24P02	65.0
10S03E25B003	10S3E25B03	64.0	10S03E25D001	10S3E25D01	89.0	10S03E25D002	10S3E25D02	92.0
10S03E25D004	10S3E25D04	89.0	10S03E25D007	10S3E25D07	47.0	10S03E25D008	10S3E25D08	71.0
10S03E25K003	10S3E25K03	43.0	10S03E25L002	10S3E25L02	26.0	10S03E25M003	10S3E25M03	33.0
10S03E25Q002	10S3E25Q02	67.0	10S03E25Q011	10S3E25Q11	71.0	10S03E25Q014	10S3E25Q14	54.0
10S03E25Q015	10S3E25Q15	57.0	10S03E25R004	10S3E25R04	73.0	10S03E26C001	10S3E26C01	24.0
10S03E26C002	10S3E26C02	10.0	10S03E26C005	10S3E26C05	39.0	10S03E26E007	10S3E26E07	4.6
10S03E26G001	10S3E26G01	37.0	10S03E26G005	10S3E26G05	22.0	10S03E26G007	10S3E26G07	41.0
10S03E26J002	10S3E26J02	28.0	10S03E27A001	10S3E27A01	8.8	10S03E27K001	10S3E27K01	5.8
10S03E34L004	10S3E34L04	1.6	10S03E34L006	10S3E34L06	2.1	10S03E34M003	10S3E34M03	5.7
10S03E34M006	10S3E34M06	3.9	10S03E34N004	10S3E34N04	3.8	10S03E34N005	10S3E34N05	47.0
10S03E36G004	10S3E36G04	40.0	10S03E36G012	10S3E36G12	38.0	10S04E06E008	10S4E06E08	18.0
10S04E06E011	10S4E06E11	62.0	10S04E06G003	10S4E06G03	1.9	10S04E06M009	10S4E06M09	44.0

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State Well Number	Old Well Number	Nitrate Conc. mg/L	State Well Number	Old Well Number	Nitrate Conc. (mg/L)	State Well Number	Old Well Number	Nitrate Conc. mg/L
10S04E06M010	10S4E06M10	40.0	10S04E06M012	10S4E06M12	49.0	10S04E06M018	10S4E06M18	29.0
10S04E06M021	10S4E06M21	47.0	10S04E06N004	10S4E06N04	44.0	10S04E06N005	10S4E06N05	51.0
10S04E06N014	10S4E06N14	46.0	10S04E06Q003	10S4E06Q03	31.0	10S04E06R003	10S4E06R03	22.0
10S04E07A001	10S4E07A01	3.1	10S04E07A004	10S4E07A04	8.3	10S04E07D006	10S4E07D06	55.0
10S04E07D009	10S4E07D09	68.0	10S04E07D011	10S4E07D11	69.0	10S04E07E001	10S4E07E01	65.0
10S04E07E008	10S4E07E08	4.7	10S04E07E009	10S4E07E09	67.0	10S04E07E015	10S4E07E15	82.0
10S04E07E019	10S4E07E19	79.0	10S04E07E020	10S4E07E20	73.0	10S04E07E022	10S4E07E22	88.0
10S04E07E025	10S4E07E25	74.0	10S04E07E030	10S4E07E30	88.0	10S04E07E031	10S4E07E31	71.0
10S04E07E033	10S4E07E33	57.0	10S04E07F004	10S4E07F04	50.0	10S04E07F015	10S4E07F15	59.0
10S04E07F017	10S4E07F17	33.0	10S04E07H005	10S4E07H05	13.0	10S04E07H009	10S4E07H09	43.0
10S04E07H011	10S4E07H11	11.0	10S04E07J001	10S4E07J01	16.0	10S04E07K006	10S4E07K06	30.0
10S04E07K007	10S4E07K07	56.0	10S04E07K016	10S4E07K16	37.0	10S04E07L003	10S4E07L03	64.0
10S04E07L004	10S4E07L04	7.8	10S04E07M004	10S4E07M04	79.0	10S04E07M016	10S4E07M16	46.0
10S04E07N003	10S4E07N03	41.0	10S04E07N004	10S4E07N04	43.0	10S04E07N008	10S4E07N08	47.0
10S04E07N011	10S4E07N11	39.0	10S04E07N012	10S4E07N12	41.0	10S04E07N014	10S4E07N14	44.0
10S04E07N015	10S4E07N15	47.0	10S04E07N016	10S4E07N16	46.0	10S04E07N017	10S4E07N17	43.0
10S04E07N021	10S4E07N21	39.0	10S04E07N023	10S4E07N23	43.0	10S04E07R009	10S4E07R09	26.0
10S04E07R014	10S4E07R14	36.0	10S04E08D002	10S4E08D02	11.0	10S04E08M002	10S4E08M02	4.6
10S04E08M004	10S4E08M04	7.4	10S04E08M005	10S4E08M05	8.1	10S04E17C009	10S4E17C09	27.0
10S04E17E003	10S4E17E03	59.0	10S04E17F001	10S4E17F01	15.0	10S04E17G006	10S4E17G06	8.9
10S04E17M008	10S4E17M08	35.0	10S04E17Q003	10S4E17Q03	24.0	10S04E17Q009	10S4E17Q09	17.0
10S04E18A002	10S4E18A02	57.0	10S04E18B014	10S4E18B14	62.0	10S04E18J004	10S4E18J04	42.0
10S04E18J008	10S4E18J08	55.0	10S04E18K009	10S4E18K09	51.0	10S04E18K011	10S4E18K11	55.0
10S04E18K017	10S4E18K17	49.0	10S04E18R011	10S4E18R11	39.0	10S04E18R014	10S4E18R14	50.0
10S04E19A005	10S4E19A05	40.0	10S04E19B006	10S4E19B06	28.0	10S04E19C006	10S4E19C06	31.0

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State Well Number	Old Well Number	Nitrate Conc. mg/L	State Well Number	Old Well Number	Nitrate Conc. (mg/L)	State Well Number	Old Well Number	Nitrate Conc. mg/L
10S04E19E001	10S4E19E01	19.0	10S04E19E002	10S4E19E02	17.0	10S04E19G001	10S4E19G01	34.0
10S04E19L002	10S4E19L02	28.0	10S04E20E002	10S4E20E02	44.0	10S04E20J008	10S4E20J08	17.0
10S04E20L005	10S4E20L05	45.0	10S04E21E002	10S4E21E02	64.0	10S04E21K002	10S4E21K02	1.3
10S04E21M002	10S4E21M02	16.0	10S04E21M003	10S4E21M03	18.0	10S04E21P002	10S4E21P02	22.0
10S04E21P003	10S4E21P03	21.0	10S04E21P003	10S4E21P03	21.0	10S04E21P004	10S4E21P04	22.0
10S04E21Q003	10S4E21Q03	18.0	10S04E21Q004	10S4E21Q04	56.0	10S04E21Q005	10S4E21Q05	16.0
10S04E21R003	10S4E21R03	18.0	10S04E26N001	10S4E26N01	14.0	10S04E27D003	10S4E27D03	8.8
10S04E27D009	10S4E27D09	43.0	10S04E27F006	10S4E27F06	11.0	10S04E27F007	10S4E27F07	38.0
10S04E27G002	10S4E27G02	56.0	10S04E27K002	10S4E27K02	3.0	10S04E27K006	10S4E27K06	24.0
10S04E27K007	10S4E27K07	14.0	10S04E27L004	10S4E27L04	28.0	10S04E27M007	10S4E27M07	28.0
10S04E28A006	10S4E28A06	71.0	10S04E28B003	10S4E28B03	49.0	10S04E28B006	10S4E28B06	24.0
10S04E28C004	10S4E28C04	47.0	10S04E28C008	10S4E28C08	33.0	10S04E28D009	10S4E28D09	57.0
10S04E28D010	10S4E28D10	21.0	10S04E28D011	10S4E28D11	49.0	10S04E28F003	10S4E28F03	40.0
10S04E28G004	10S4E28G04	58.0	10S04E28R003	10S4E28R03	57.0	10S04E29D002	10S4E29D02	40.0
10S04E30F005	10S4E30F05	44.0	10S04E30J006	10S4E30J06	27.0	10S04E30M003	10S4E30M03	80.0
10S04E30M005	10S4E30M05	84.0	10S04E30P002	10S4E30P02	45.0	10S04E33A002	10S4E33A02	110.0
10S04E33G003	10S4E33G03	74.0	10S04E33G007	10S4E33G07	59.0	10S04E33G010	10S4E33G10	130.0
10S04E33G012	10S4E33G12	150.0	10S04E33M004	10S4E33M04	98.0	10S04E33M006	10S4E33M06	37.0
10S04E34B002	10S4E34B02	50.0	10S04E34L007	10S4E34L07	70.0	10S04E34L010	10S4E34L10	27.0
10S04E34L011	10S4E34L11	31.0	11S03E02A002	11S3E02A02	9.0	11S03E02C002	11S3E02C02	5.5
11S03E02C003	11S3E02C03	6.6	11S03E05B003	11S3E05B03	49.0	11S04E02D009	11S4E02D09	61.0
11S04E02N003	11S4E02N03	13.0	11S04E03H003	11S4E03H03	25.0	11S04E03N001	11S4E03N01	52.0
11S04E03N002	11S4E03N02	130.0	11S04E03N009	11S4E03N09	96.0	11S04E03P008	11S4E03P08	85.0
11S04E04C008	11S4E04C08	83.0	11S04E04G001	11S4E04G01	49.0	11S04E04K008	11S4E04K08	130.0
11S04E06A005	11S4E06A05	15.0	11S04E09A002	11S4E09A02	5.4	11S04E10D005	11S4E10D05	24.0

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11S04E10L018	11S4E10L18	11.0	11S04E11F002	11S4E11F02	75.0	11S04E11J006	11S4E11J06	16.0
11S04E12D001	11S4E12D01	22.0	11S04E13A002	11S4E13A02	55.0	11S04E15K003	11S4E15K03	67.0
11S04E15P004	11S4E15P04	33.0	11S04E15P005	11S4E15P05	12.0	11S04E17C001	11S4E17C01	21.0
11S04E17D008	11S4E17D08	16.0	11S04E17F003	11S4E17F03	13.0	11S04E18G001	11S4E18G01	50.0
11S04E21D004	11S4E21D04	15.0	11S04E21G001	11S4E21G01	66.0	11S04E21J003	11S4E21J03	65.0
11S04E22N004	11S4E22N04	29.0	11S04E22P002	11S4E22P02	30.0			